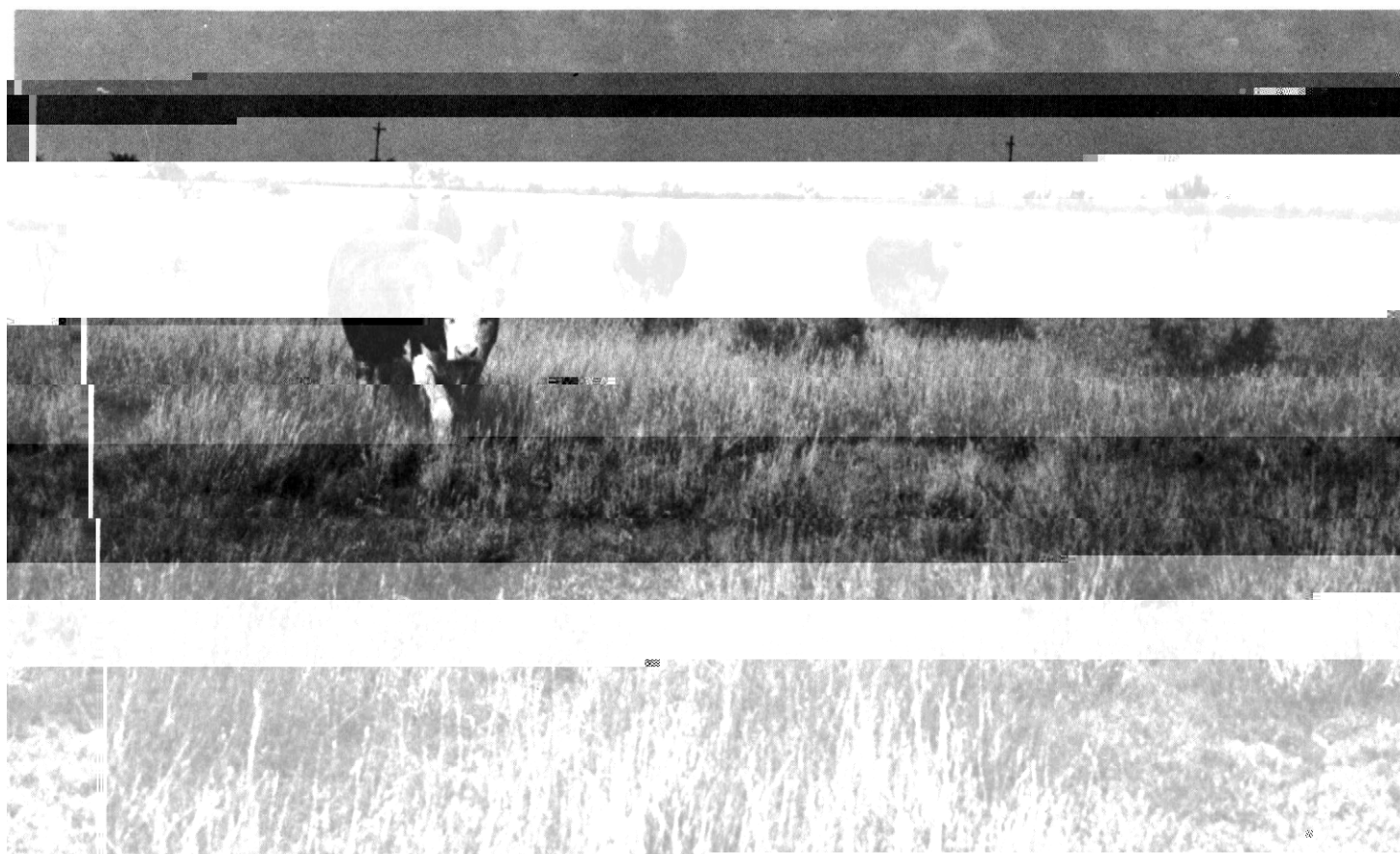


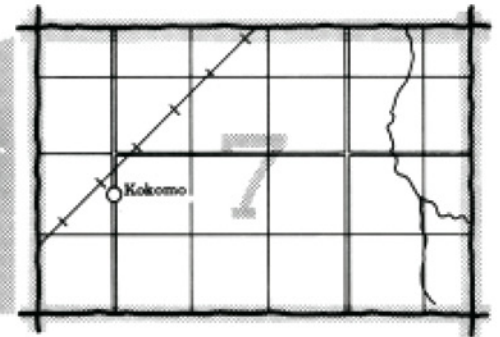
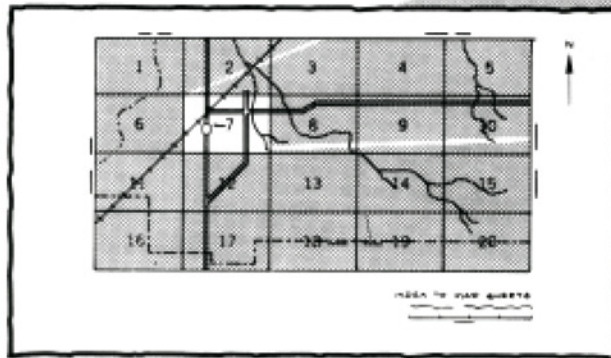
SOIL SURVEY OF Glasscock County, Texas



United States Department of Agriculture
Soil Conservation Service
In cooperation with
Texas Agricultural Experiment Station

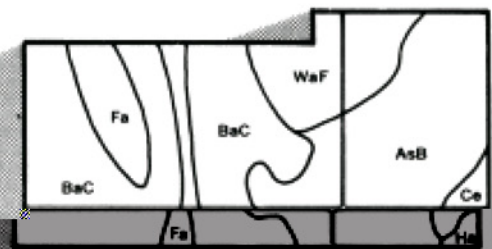
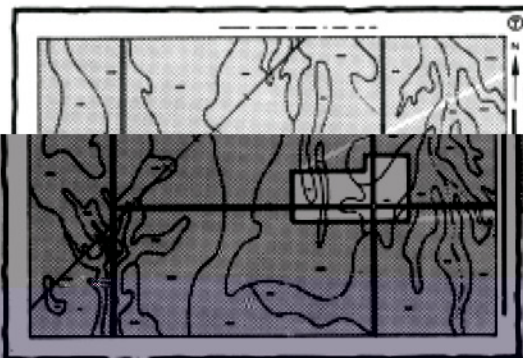
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"



2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

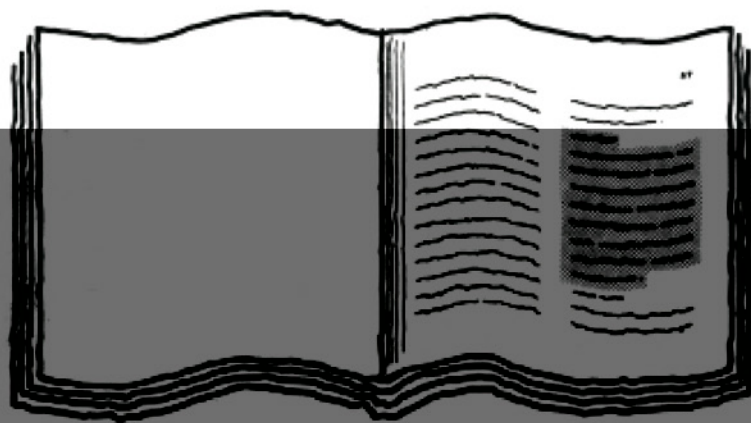


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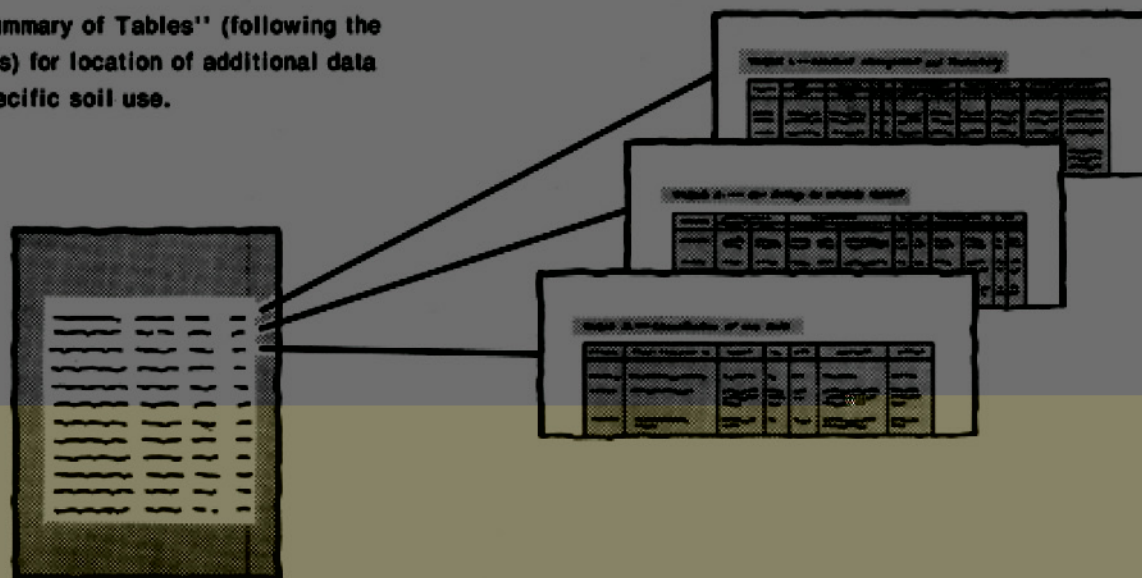
THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.

A detailed view of the 'Index to Soil Map Units' table. It is a two-column table with the following structure:

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49. 1000000000	100
50. 1000000000	100

6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all who need the information, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1969-73. Soil names and descriptions were approved in 1974. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1973. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the North Concho River Soil and Water Conservation District and the Mustang Soil and Water Conservation District.

Soil maps in this survey may be copied without permission, but any enlargement of these maps could cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Cover: Hereford cattle grazing on Clay Loam range site. The soil is
Angelo silty clay loam. 0 to 1 percent slopes.



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Foreword

I would like to introduce the soil survey of Glasscock County, Texas. This publication can help you and your community to plan and to use wisely one of our most precious natural resources—the soil.

This soil survey is intended for many different users. It can help a homebuyer or developer determine soil-related hazards or limitations that affect homesites. It can help land use planners determine the suitability of areas for housing or onsite sewage disposal systems. This survey can help a farmer

estimate the potential crop or forage production of his land. It can be used to determine the suitability and limitations of soils for pipelines, buildings, landfills, recreation areas, and many other uses.

Why do we need soil information? Many people assume that soils are all more or less alike. They are unaware that great differences in soil properties can occur within even short distances.

Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey soils are poorly suited to septic tank absorption fields.

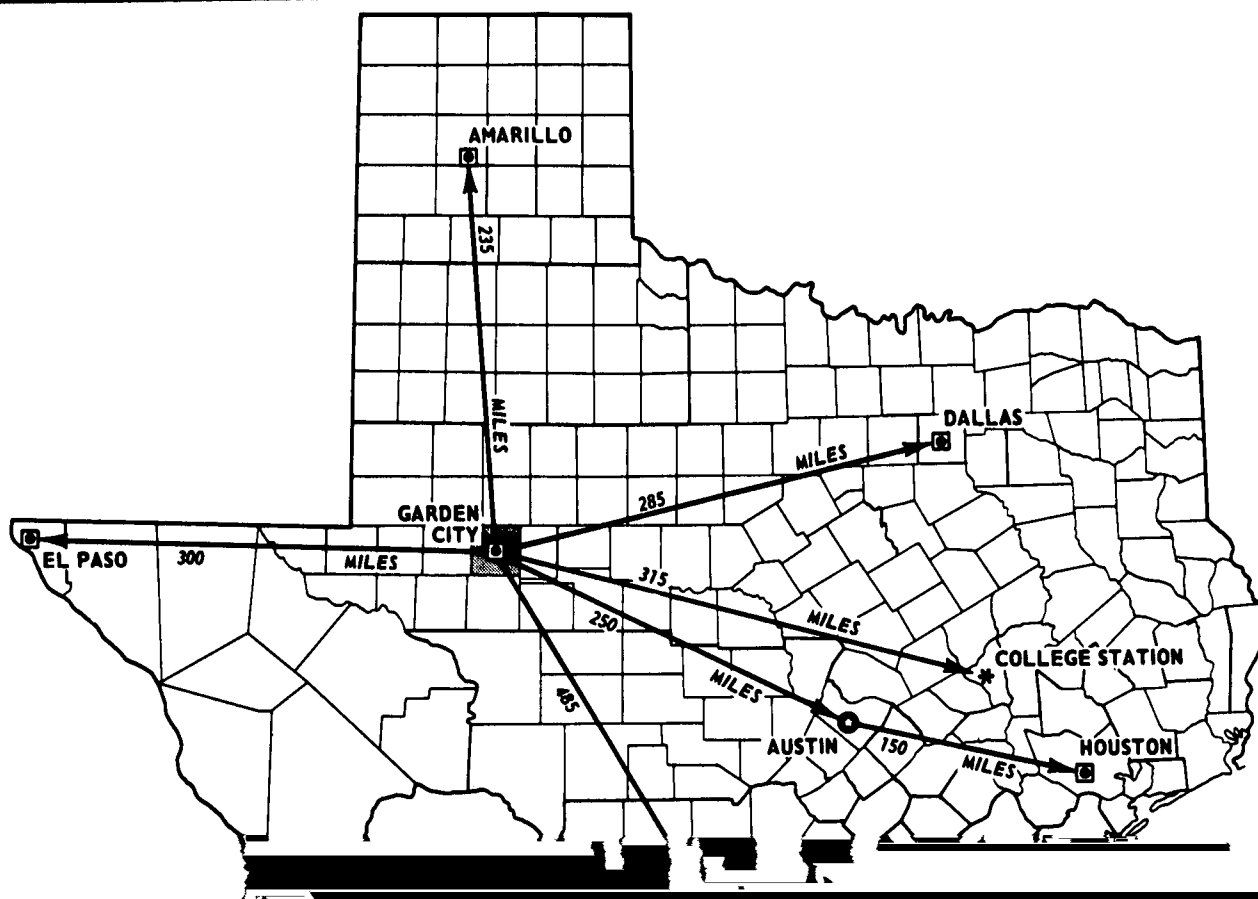
These and many other soil properties that affect land use are described in this soil survey. The survey also shows the location of broad areas of soils on the general soil map and the location of each kind of soil on detailed maps at the back of this publication. The publication provides descriptions of each kind of soil in the survey area, and much information is given about each soil for specified uses. Soil-related hazards, limitations, and potential for various land uses are highlighted.

We cannot explain here all the ways this soil survey can help you. If you need additional information or assistance in using this survey, please call your local office of the Soil Conservation Service or the County Extension Service. The soil conservationist or soil scientist assigned to the North Concho River Soil and Water Conservation District and the Mustang Soil and Water Conservation District or the county-extension agent can assist you.

I believe that this soil survey, along with other resource information, will enable you to have a better environment and a better life. The wide-spread use of this publication will greatly assist all of us in the conservation, development, and productive use of our soil, water, and related resources.

George C. Mader

State Conservationist



SOIL SURVEY OF GLASSCOCK COUNTY, TEXAS

By Marvin L. Dixon, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service, in
cooperation with the Texas Agricultural Experiment Station

Introduction

GLASSCOCK COUNTY is located in the southern part of the High Plains and in the northwestern part of the Edwards Plateau in the Great Plains region (see map on facing page). The total area is 552,960 acres, or 864 square miles. The county is a square, each side of which is about 29.4 miles long.

The area is generally a nearly level to undulating plain

Spring, Texas, which is 27 miles due north of Garden City. For all practical purposes the climate of Glasscock County is the same as that recorded at the Big Spring station.

The climate is subtropical: it is dry in winter and warm and humid in summer. Rainfall averages about 16 inches annually. Most of this falls in the form of thundershowers during the period May through October when the prevailing southwesterly wind predominates. Glasscock County

ture maximums average about 78 degrees F, and daily minimums average about 51 degrees F.

Summer is a pleasant season. While afternoon temperatures are sometimes hot, most nights are pleasantly cool. Daily minimums are in the upper sixties and low seven-

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are located, and how they can be used. The soil scientists went into the survey area to learn what kinds of soils there are.

have little or no soil. These kinds of mapping units are discussed in the section "Soil Maps for Detailed Planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. Existing ratings of suitabilities and limitations (interpretations) of the soils are field tested and modified as necessary during the course of the survey, and new interpretations are added to meet local needs. This is done mainly through field observations of behavior of different kinds of soil for different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and other information available from state and local specialists. For example, data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so as to be readily useful to different groups of users, among them farmers, managers of rangeland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

Descriptions and Potentials of Soil Associations

The six soil associations in Glasscock County are described in the following paragraphs.

1. Reagan Association

Deep, nearly level and gently sloping, calcareous, loamy soils on uplands

This association is made up mainly of nearly level to gently sloping soils. Slopes are 0 to 3 percent. The association makes up about 36 percent of the county. Reagan soils make up about 92 percent of the association and less extensive areas of Angelo, Bippus, Conger, Lipan, and Midessa soils make up the remaining 8 percent (fig. 1).

Reagan soils are on broad plateaus, in valley fill, and on alluvial fans. These soils have a surface layer of friable, moderately alkaline silty clay loam about 10 inches thick. This layer is dark brown in the upper 4 inches and brown in the lower 6 inches. The next layer is friable, moderately alkaline silty clay loam about 19 inches thick. It is brown in the upper 9 inches and light brown in the lower 10 inches. Between the depths of 29 and 58 inches, the soil is friable, moderately alkaline, pink clay loam. It is

2. Angelo-Rioconcho Association

Deep, nearly level and gently sloping, calcareous, loamy and clayey soils on uplands and bottom lands

This association is made up mainly of nearly level to gently sloping soils. Slopes are 0 to 3 percent. The association makes up about 20 percent of the county. Angelo soils make up about 66 percent of the association; Rioconcho soils about 11 percent; and less extensive

most limiting features. Potential for recreational uses is medium mainly because of slope, slow percolation, flooding, and clay content of the surface layer.

3. Conger Association

Shallow, gently sloping, calcareous, loamy soils on uplands

This association is made up mainly of gently sloping

tion; Midessa soils, about 36 percent; and less extensive areas of Acuff, Arvana, Bippus, Estacado, Lipan, Patricia, Potter, and Reagan soils, the remaining 24 percent (fig. 2).

Amarillo soils, which have slopes of 0 to 3 percent, are on nearly level to gently sloping uplands. They have a surface layer of friable, neutral, brown fine sandy loam about 8 inches thick. Between the depths of 8 and 34 inches, the soil is friable, mildly alkaline sandy clay loam. It is reddish brown in the upper 10 inches and yellowish red in the lower 16 inches. The next layer is friable, moderately alkaline, reddish yellow sandy clay loam about 18 inches thick. The next lower layer is friable, moderately alkaline, pink sandy clay loam about 12 inches thick. It contains about 30 percent, by volume, soft masses and weakly cemented concretions of calcium carbonate. Between the depths of 64 and 80 inches, the soil is friable, moderately alkaline, reddish yellow sandy clay loam and is about 20 percent, by volume, calcium carbonate.

Midessa soils, which have slopes of 0 to 5 percent, are on nearly level to gently sloping uplands. These soils have a surface layer of very friable, moderately alkaline, brown fine sandy loam about 9 inches thick. The next layer is very friable, moderately alkaline sandy clay loam about 25 inches thick. It is brown in the upper 10 inches and light brown in the lower 15 inches. The next layer is friable, moderately alkaline, pink clay loam about 24 inches thick. It contains about 45 percent, by volume, soft masses and weakly cemented concretions of calcium carbonate. Between the depths of 58 and 80 inches, the soil is friable, moderately alkaline, light reddish brown clay loam and contains about 25 percent, by volume, calcium carbonate.

The deep, loamy Acuff soils and Estacado soils are on nearly level uplands. The moderately deep, loamy Arvana soils are on gently sloping upland plains. The deep, loamy Bippus soils are on nearly level bottoms of drainageways and outwash fans. The deep, clayey Lipan soils are on nearly level bottoms of depressions or shallow playas. The deep, sandy Patricia soils are on nearly level to gently sloping upland plains. The very shallow, loamy Potter soils are on gently sloping to sloping, broad, convex ridges. The deep, loamy Reagan soils are nearly level to gently sloping in valleys or on alluvial fans.

The soils of this association are used for range and cultivated crops.

Potential for growing cultivated crops is high. Low rainfall and lack of irrigation water limit the acreage of this association used for cultivation. When the soil is cultivated, cotton and grain sorghum are the main crops.

Potential for range is high. Yields of short and mid grasses are good during favorable years.

Potential for most urban uses is high. Slope, seepage, low strength, and corrosivity to uncoated steel are the most limiting features, but they are easily overcome with good design and installation procedures. Potential for

5. Ector Association

Very shallow and shallow, gently sloping to steep, calcareous, loamy soils on uplands

This association is made up mainly of gently sloping to steep soils. Slopes are 1 to 40 percent, but they average about 12 percent. The association makes up about 10 percent of the county. Ector soils make up about 73 percent of the association, and less extensive areas of Angelo, Conger, Mereta, and Rioconcho soils make up the remaining 27 percent (fig. 3).

Ector soils are on limestone plateaus, plains, and erosional landscapes. They have a surface layer of friable, moderately alkaline, dark brown gravelly clay loam about 9 inches thick. This layer is about 50 percent, by volume, limestone fragments. The surface layer has an abrupt boundary that is underlain by fractured limestone bedrock that extends to depths greater than 40 inches.

The deep, loamy Angelo soils are on nearly level to gently sloping uplands in the association. The shallow, loamy Conger and Mereta soils are on ridges, foot slopes, and outwash plains. The Rioconcho soils are deep and clayey and are on flood plains of streams and drainageways.

The soils of this association are used almost entirely for range. In a few areas, the limestone bedrock underlying the soils is mined for roadbed material.

Potential for cultivated crops is low. Steep slopes, shallow or very shallow rooting depth, and hazard of water erosion restrict use of the soils mainly to range. A few small areas of the less extensive soils can be cultivated. Cotton and grain sorghum are the main cultivated crops.

Potential for range is also low. Low rainfall, very low available water capacity, and restricted rooting depth limit the amount of forage that can be produced during favorable years. Native range plants are mainly short and mid grasses. Some areas have been invaded by juniper.

Potential for most urban uses is low. Slope, shallow or very shallow depth to limestone bedrock, and corrosivity to uncoated steel are the most limiting features. Potential for recreation uses is medium. Slope and small stones on the surface restrict use of the soils for camp areas, picnic areas, playgrounds, paths, and trails.

6. Patricia-Pyote Association

Deep, nearly level and gently sloping, noncalcareous, sandy soils on uplands

This association is made up mainly of nearly level to gently sloping soils. Slopes are 0 to 5 percent. The association makes up about 5 percent of the county. Patricia soils make up about 46 percent of the association; Pyote soils, about 28 percent; and less extensive areas of Amarillo, Potter, and Springer soils, the remaining 26 percent (fig. 4).

Patricia soils, which have slopes of 0 to 5 percent, are

loamy fine sand about 14 inches thick. The next 32 inches consists of friable, neutral, red sandy clay loam. Between the depths of 46 and 80 inches, the soil is friable, mildly alkaline sandy clay loam. This layer is yellowish red in the upper 18 inches and reddish yellow in the lower 16 inches.

Pyote soils, which have slopes of 0 to 5 percent, are on nearly level to gently sloping uplands. These soils have a surface layer of loose, slightly acid fine sand about 26 inches thick. This layer is brown in the upper 6 inches and light brown in the lower 20 inches. The next layer is very friable, slightly acid, reddish yellow loamy fine sand about 20 inches thick. The next lower layer, to a depth of about 60 inches, is very friable, neutral, reddish yellow loamy fine sand. Between the depths of 60 to 80 inches, the soil is loose, strongly acid, reddish yellow fine sand.

The deep, loamy Amarillo soils are on nearly level to gently sloping uplands. The very shallow, loamy Potter soils are on gently sloping to sloping, broad, convex ridges. The deep, sandy Springer soils are on nearly level to gently sloping uplands.

The soils of this association are used mainly for range. A few areas of the Patricia soils are cultivated, but the Pyote soils are not suitable for cultivation.

Potential for growing cultivated crops is medium. Low rainfall and the soil blowing hazard are the most restrictive factors. Cotton and grain sorghum are the main crops.

Potential for range is high. Native range plants are mainly tall grasses. Yields of forage are good during favorable years.

The soils of this association have a high potential for most urban uses. When soils are used for reservoirs or sewage lagoons, seepage and low strength are the most limiting factors. Potential for recreational uses is medium mainly because of slope and the sandy surface layer.

Land Use Consideration

The soil associations in Glasscock County vary widely in their potential for major land uses, as is indicated in table 1. For each land use, the potential of each soil association is rated in relation to the other soil associations. Soil limitations are also indicated in general terms. The ratings of soil potential reflect the relative cost of management practices and also the hazard of continuing soil related problems after such practices are installed. The ratings do not consider location in relation to existing transportation systems or other kinds of facilities.

Kinds of land uses include cultivated crops, specialty crops, range, urban use, and recreation. Cultivated farm crops grown in the survey area include cotton, grain sorghum, and wheat. Specialty crops include vegetables and nursery crops, which are grown on limited acreage and generally require intensive management. Range refers to land in native range plants. Urban uses include land used for residential, commercial, and industrial sites. Recreation includes nature study trails, wilderness, picnic and camp areas, and playgrounds.

In general, the kinds of soils, low rainfall, and lack of irrigation water are the most important factors that influence land use in Glasscock County.

Presently, about 88 percent of the county is used for range, and about 9 percent is used for cultivated farm crops. However, it is indicated in table 1 that about 18 percent of the county has a high potential for range, about 56 percent has a medium potential for range, and about 26 percent has a low potential for range. It is also indicated in table 1 that about 69 percent of the county has a high potential, about 5 percent has a medium potential, and about 26 percent has a low potential for cultivated farm crops. This means that about 60 percent of the county could be converted from range to cultivated farmland if water were available.

The trend in recent years has been a slight decrease in the number of acres used for range and a slight increase in the number of acres used for crops, generally as irrigation water supplies are developed.

There has also been a slight increase in the number of acres used for specialty crops, urban development, and recreational uses.

In general, the Reagan, Angelo-Rioconcho, and Amarillo-Midessa associations have a high potential for cultivated farm crops and specialty crops. The soils in these associations are deep, loamy or clayey, and are well suited to cultivation. However, they require good management practices to prevent water erosion and soil blowing. The Amarillo-Midessa association and the Patricia-Pyote association have a high potential for range and urban uses. These deep, loamy or sandy soils also require careful management to prevent water erosion and soil blowing. In addition, they require good design and installation procedures when used for urban structures. The main problems are seepage and low strength. The Amarillo-Midessa association is the only association that has a high potential for recreational uses. The more sloping areas of this association limit some playground uses. The shallow or very shallow, loamy soils of the Conger association and the Ector association have a low potential for most uses. Slope, water erosion hazard, soil blowing hazard, small stones on the surface, and depth to indurated caliche or limestone bedrock are the most limiting features.

The general soil information in this section and the more detailed information in following sections can be used as a guide in planning orderly growth and development of the county. This information is especially helpful in determining which lands to allocate to each use.

Soil Maps for Detailed Planning

The kinds of soil (mapping units) shown on the detailed soil maps at the back of this publication are described in this section. These descriptions together with the soil maps can be useful in determining the potential of soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in

enhancing, protecting, and preserving the environment. More detailed information for each soil is given in the section "Planning the Use and Management of the Soils."

Preceding the name of each mapping unit is the symbol that identifies the unit on the detailed soil map. Each mapping unit description includes general facts about the soil and a brief description of the soil profile. The potential of the soil for various major land uses is estimated. The principal hazards and limitations are indicated, and the management concerns and practices for the major uses are discussed.

A mapping unit represents an area on the landscape and consists of a dominant soil or soils for which the unit is named. Most mapping units have one dominant soil, but some have two or more dominant soils. A mapping unit commonly includes small, scattered areas of other soils. The properties of some included soils can differ substantially from those of the dominant soil or soils and thus greatly influence the use of the dominant soil. How the included soils may affect the use and management of the mapping unit is discussed.

Two mapping units in this county are made up of soils in different phases of a single series. Such mapping units are called soil associations. A soil association is made up of adjacent soils in areas large enough to be shown individually on the soil map but are shown as one unit because the time and effort of delineating them separately cannot be justified. There is a considerable degree of uniformity in pattern and extent of the dominant soils, but the soils may differ greatly one from another.

The acreage and proportionate extent of each mapping unit are given in table 2, and additional information on each unit is given in interpretive tables in other sections (see "Summary of Tables"). Many of the terms used in describing soils are defined in the Glossary.

Soil Descriptions and Potentials

CHARLES HAENISCH, conservation agronomist, Soil Conservation Service, assisted in writing this section.

The 29 kinds of soil (mapping units) in Glasscock County are described in the following paragraphs.

AcA—Acuff loam, 0 to 1 percent slopes. This deep, nearly level soil is on uplands. Slopes average about 0.7 percent. Areas are irregular in shape and range from 10 to 200 acres in size.

This soil has a surface layer of friable, neutral, brown loam about 8 inches thick. The next layer is about 15 inches of friable, mildly alkaline, reddish brown sandy clay loam. The next layer, extending from 23 to 45 inches, is friable, moderately alkaline, yellowish red sandy clay loam. Between the depths of 45 and 80 inches, the soil is friable, moderately alkaline, reddish yellow sandy clay

high. This soil has good tilth and can be worked during a wide range of moisture conditions. The rooting zone is deep and is easily penetrated by plant roots. The water erosion and soil blowing hazards are slight.

Included with this soil in mapping are small areas of Amarillo, Estacado, and Midessa soils. Also included are small areas of Acuff soils that have slopes of 1 to 3 percent. Included soils make up less than 15 percent of any one mapped area.

This soil is used for crops and range. Cotton is the main crop, but other crops can be grown.

This soil has a high potential for growing nonirrigated and irrigated cotton, grain sorghum, and wheat. Good management includes leaving residue on the surface when crops are not being grown, timely and limited tillage, and rotation of crops. These practices help to control soil blowing and water erosion and help to conserve moisture. Residue also helps to maintain soil productivity. Emergency tillage operations are occasionally necessary to roughen the soil surface. These operations help to reduce damage from soil blowing if crop growth and residue produce inadequate cover. A well-designed irrigation system and proper application of irrigation water are essential where this soil is irrigated. Both surface or sprinkler irrigation systems can be used. When this soil is irrigated, fertilizer is needed.

This soil has a medium potential for growing native range plants. Its potential is limited because of low available plant moisture during the growing season. Native range plants are mainly short grasses that produce a medium amount of forage. Potential for wildlife habitat is medium.

This soil has a high potential for most urban and recreational uses. It is corrosive to uncoated steel and has low strength. These limitations can be easily overcome by good design and careful installation procedures. Potential for recreational uses is high. Capability subclass IIe nonirrigated, IIe irrigated; Clay Loam range site.

AmA—Amarillo fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on uplands. Slopes average about 0.7 percent. Areas are irregular in shape and range from 10 to 500 acres in size.

The surface layer is friable, neutral, brown fine sandy loam about 9 inches thick. The next layer is friable, mildly alkaline sandy clay loam about 45 inches thick. It is reddish brown in the upper 20 inches and yellowish red in the lower 25 inches. Between the depths of 54 and 80 inches, the soil is friable, moderately alkaline sandy clay loam. It is pink in the upper 14 inches and reddish yellow in the lower 12 inches. This layer is about 30 to 40 percent, by volume, soft masses and weakly cemented aggregations of calcium carbonate.

Included with this soil in mapping are small areas of Acuff, Lipan, and Midessa soils. Also included are small areas of Amarillo soils with 1 to 3 percent slopes. Around the bases of mesquite trees in undisturbed areas are small sandy mounds 6 to 12 inches higher than the surrounding soil. Inclusions make up less than 15 percent of

undisturbed areas, sandy mounds 6 to 12 inches high have accumulated around the bases of mesquite trees. Inclusions comprise less than 30 percent of any one mapped area.

This soil is used mainly as range, but cultivated crops can be grown. Cotton and grain sorghum are the main

Potential for growing nonirrigated and irrigated cotton and grain sorghum is high. Keeping crop residue on or near the soil surface helps conserve moisture. Residue also helps protect the soil from water erosion and soil blowing. A properly designed irrigation system and proper application of irrigation water are essential. A surface or sprinkler system can be used. Fertilizer is necessary when this soil is irrigated.

Potential for growing native range plants is medium

essential. A sprinkler system is best adapted. If a surface system is used, bench leveling is necessary. Fertilizer is needed when this soil is irrigated.

Potential for growing native range plants is medium. Low rainfall and medium runoff limit this soil to moderate yields of short and mid grasses during favorable years. Potential for wildlife habitat is medium.

This soil has a low potential for most urban uses. Cor-

This soil has a low potential for most urban uses. Depth to indurated caliche is the most restrictive feature. Potential for most recreational uses is high. Slope restricts some playground uses. Capability subclass IIIe nonirrigated, IIIe irrigated; Sandy Loam range site.

BcA—Bippus clay loam, 0 to 1 percent slopes. This deep, nearly level soil is in drainageways and on adjacent outwash fans. It occasionally receives runoff from adjacent slopes of upland soils. Slopes average about 0.5 percent. Areas are long and narrow. They extend for several miles.

The surface layer is friable, moderately alkaline clay loam about 24 inches thick. It is dark grayish brown in the upper 12 inches and dark brown in the lower 12 inches. Buried soil layers occur below 24 inches. Between the depths of 24 and 56 inches, the soil is friable, moderately alkaline, brown clay loam and contains about 2 percent, by volume, calcium carbonate. Between the depths of 56 and 62 inches, the soil is friable, moderately alkaline, light brown clay loam.

This soil is well drained. Surface runoff is medium. Permeability is moderate, and available water capacity is high. The rooting zone is deep and easily penetrated by

2.5 percent. Areas are irregular in shape and range from 10 to 93 acres in size.

This soil has a surface layer of friable, moderately alkaline, brown fine sandy loam about 5 inches thick. Between the depths of 5 and 13 inches, the soil is friable, moderately alkaline, light brown fine sandy loam and is about 2 percent, by volume, calcium carbonate concretions. At a depth of 13 inches, the soil is underlain by whitish indurated caliche that extends to a depth of about 35 inches. Between the depths of 35 and 60 inches, the soil is pinkish white, weakly cemented caliche that has texture of clay loam.

This soil is well drained. Surface runoff is medium. Permeability is moderately rapid, and available water capacity is low. The rooting zone is shallow. The water erosion and soil blowing hazards are moderate.

Included with this soil in mapping are small areas of Conger, Midessa, and Reagan soils. Included soils make up less than 15 percent of any one mapped area.

This soil is not suitable for cultivation. Shallow depth to indurated caliche and susceptibility to water erosion and soil blowing restrict use of the soil to range. In a few areas, the layers of caliche underlying this soil are mined

This soil is used mainly for range, but a few small areas are cultivated. Cotton, grain sorghum, and wheat may be grown.

Potential for growing nonirrigated and irrigated cotton, grain sorghum, or wheat is medium. Keeping crop residue on or near the soil surface helps conserve moisture and prevent water erosion and soil blowing. Contour farming, terraces, and grassed waterways help to control water erosion from excess runoff. When cuts or excavations exceed 6 inches, there is a hazard of cutting into soil material that contains concentrations of calcium carbonate. If the soil is irrigated, a well-designed irrigation system and proper application of irrigation water are essential. Both surface and sprinkler irrigation systems can be used. Fertilizer is needed for adequate yields.

Potential for growing native range plants is medium. Potential for wildlife habitat is also medium.

This soil has a medium potential for most urban uses. Shrinking and swelling with changes in moisture, corrosivity to uncoated steel, and low strength are the most restrictive factors. Good design and installation procedures are needed. Potential for recreational uses is medium. The dusty clay loam surface layer is the most restrictive feature. Capability subclass IIIe nonirrigated, and IIe irrigated; Loamy range site.

CnC—Conger clay loam, 1 to 5 percent slopes. This shallow, gently sloping soil is on uplands, mainly on ridges, divides, and side slopes around playas. Slopes average about 3 percent. Areas are irregular in shape and range from 10 to several hundred acres in size.

This soil has a surface layer of friable, moderately alkaline, brown clay loam about 5 inches thick. Between the depths of 5 and 18 inches, the soil is friable, moderately alkaline, pale brown clay loam. It has an abrupt boundary and is underlain by a layer of whitish indurated caliche (fig. 8). This layer is about 17 inches thick. Between the depths of 35 and 60 inches, the soil is pinkish white, weakly cemented caliche that has texture similar to clay loam.

This soil is well drained. Surface runoff is medium. Permeability is moderate, and available water capacity is low. The rooting zone is shallow. The water erosion and soil blowing hazards are moderate.

Included with this soil in mapping are small areas of Blakeney, Ector, and Reagan soils. Included soils make up less than 15 percent of any one mapped area.

This soil is not suitable for cultivation. Slope, shallow depth to indurated caliche, and susceptibility to water erosion and soil blowing restrict use of the soil to range. In a few areas, the layers of caliche underlying this soil are mined and used as sources of fill material in road construction.

Potential for growing native range plants is low. Low rainfall, low available water capacity, and shallow rooting depth limit the amount of forage grown. Potential for wildlife habitat is medium in areas close to grain and seed crops.

This soil has a low potential for most urban uses. Shallow depth to indurated caliche is the most limiting feature. Potential for recreational uses is medium mainly because the soil is dusty. Capability subclass VIe nonirrigated; Shallow range site.

COD—Cottonwood association, undulating. The soils in this association consist of very shallow, undulating soils on uplands. Slopes range from 1 to 8 percent but average about 3 percent. Areas are oblong to irregular in shape and range from 15 to 176 acres in size.

The composition of this association is more variable than that of other mapping units in the county. Mapping has been controlled well enough, however, for the anticipated use of the soils.

The Cottonwood soils in this association have a surface layer of friable, moderately alkaline loam about 7 inches thick. This layer is grayish brown in the upper 3 inches and light brownish gray in the lower 4 inches. It has an abrupt boundary and is underlain by a layer of white, soft chalky gypsum that extends to a depth greater than 20 inches.

The soils in this association are well drained. Surface runoff is rapid. Permeability is moderate, and available water capacity is very slow. The water erosion and soil blowing hazards are moderate.

Included with these soils in mapping are small areas of Monahans soils and areas of gypsum material covered with less than 3 inches of soil. In a few areas, the soil is more than 12 inches thick over gypsum. Also included are a few U-shaped gullies that are 10 to 25 inches wide and 6 to 15 inches deep. Inclusions make up less than 30 percent of any one mapped area.

These soils are not suitable for cultivation because of slope, very shallow rooting depth, and susceptibility to water erosion. They are used mainly for range, but potential for growing native range plants is low. Low rainfall, rapid runoff, very low available water capacity, and restricted rooting depth limit the amount of forage produced. Potential for wildlife habitat is also low.

The soils in this association have a low potential for most urban uses. Slope, depth to gypsum, seepage, and corrosivity to uncoated steel and concrete are the most limiting features. Potential for recreational uses is medium because the soils are too sloping and have a dusty surface layer. Capability subclass VIIs nonirrigated; Gyp range site.

ECD—Ector association, undulating. This association consists of shallow or very shallow, gently undulating to steep, soils on uplands. It is on limestone plateaus, plains, and erosional landscapes. Slopes range from 1 to 40 percent but average about 12 percent. About 17 percent of the surface area is covered with limestone rocks. Areas are irregular in shape and range from 25 acres to several hundred acres in size.

The composition of this association is more variable than that of other mapping units in the county. Mapping has been controlled well enough, however, for the anticipated use of the soils.

The Ector soils in this association have a surface layer of friable, moderately alkaline, dark brown gravelly clay loam about 9 inches thick (fig. 9). Limestone fragments make up about 50 percent, by volume, of the surface layer. This layer has an abrupt boundary and is underlain by fractured limestone bedrock that extends to depths greater than 40 inches.

The soils in this association are well drained. Surface runoff is rapid. Permeability is moderate, and available water capacity is very low. The rooting zone is shallow or very shallow. The water erosion hazard is moderate. The soil blowing hazard is slight.

Included with these soils in mapping are small areas of Angelo, Broome, Conger, and Reagan soils. Also included are outcrops of limestone bedrock on ridgetops and along benched areas on the side slopes of ridges. Inclusions make up less than 25 percent of any one mapped area.

The soils in this association are not suitable for cultivation because of slope, shallow or very shallow rooting depth, and susceptibility to water erosion. These soils are used mainly for range (fig. 10), but potential for growing native range plants is low. Low rainfall, rapid runoff, very low available water capacity, and restricted rooting depth limit the amount of forage produced. Potential for wildlife habitat is also low.

The soils in this association have a low potential for most urban uses and medium potential for most recreational uses. Slope, small stones on the surface, shallow or very shallow depth to bedrock, and corrosivity to uncoated steel are the most limiting features. Capability subclass VII is nonirrigated; Limestone Hill range site.

EsA—Estacado clay loam, 0 to 1 percent slopes. This deep, nearly level soil is on upland plains. Slopes average about 0.6 percent. Areas are irregular in shape and range from 10 to 70 acres in size.

This soil has a surface layer of friable, moderately alkaline, brown clay loam about 16 inches thick. The next layer, from 16 to 36 inches, is friable, moderately alkaline clay loam and has a few concretions of calcium carbonate. It is brown in the upper 9 inches and light brown in the lower 11 inches. Between the depths of 36 and 60 inches the soil is friable, moderately alkaline, pink clay loam and is about 45 percent, by volume, calcium carbonate. Between the depths of 60 and 80 inches, the soil is friable, moderately alkaline, reddish yellow clay loam and is about 30 percent, by volume, calcium carbonate.

This soil is well drained. Surface runoff is slow. Permeability is moderate, and available water capacity is high. This soil has good tilth. The rooting zone is easily penetrated by plant roots. The water erosion hazard is slight, and the soil blowing hazard is moderate.

Included with this soil in mapping are small areas of Acuff, Amarillo, and Midessa soils. Inclusions make up less than 15 percent of any one mapped area.

This soil is used as cropland and range. Cotton is the main crop, but other crops can be grown.

This soil has a high potential for growing nonirrigated cotton, grain sorghum, and wheat. Careful management is

needed to keep crop residue on the soil surface through critical erosion periods. Residue management helps control soil blowing and water erosion and conserve moisture. Residue also helps to maintain soil productivity. Occasionally, emergency tillage is necessary to roughen the soil surface to reduce soil blowing if crop growth does not produce enough residue for protective cover. A properly designed irrigation system and proper application of irrigation water are essential. A surface system or sprinkler system can be used. This soil needs to be fertilized if it is irrigated.

This soil has a medium potential for growing native range plants. Low rainfall limits production. Native range plants are mainly short grasses, which produce medium amounts of forage. Potential for wildlife habitat is medium.

This soil has a high potential for most urban uses. Corrosivity to uncoated steel and low strength are the most limiting factors, but these are easily overcome by good design and careful installation procedures. Potential for recreational uses is medium. The clay loam surface layer is the most limiting feature. Capability subclass IIe nonirrigated, IIe irrigated; Clay Loam range site.

Lc—Lipan clay, depressional. This deep, nearly level soil is on the bottoms of depressions or shallow playas. Slopes range from 0 to 1 percent but average less than 0.5 percent. The surrounding plains range from 2 to 15 feet higher in elevation than the playa bottoms. Soil areas are circular to oval in shape and range from 10 to 50 acres in size. In undisturbed areas, the surface is characterized by gilgai microrelief consisting of microknolls and microdepressions. The microknolls are 6 to 20 inches higher than the bottoms of the microdepressions. They are 2 to 10 feet across and from 3 to 20 feet apart. Evidence of gilgai microrelief is destroyed after a few years of cultivation.

In the center of a microdepression, the surface layer is very firm, moderately alkaline, gray clay about 22 inches thick. This layer changes gradually to a layer, about 33 inches thick, of very firm, moderately alkaline, gray clay that contains a few slickensides. Between the depths of 55 and 70 inches, the soil is very firm, moderately alkaline, light brownish gray clay and is about 4 percent, by volume, calcium carbonate concretions.

This soil is somewhat poorly drained. Surface runoff is ponded. Runoff from surrounding soils covers this soil to a depth of a few inches to several feet for periods of a few days to several weeks after rains. When dry, this soil has wide, deep cracks that extend to the surface. Water enters the soil rapidly when the soil is cracked. When the soil is wet, the cracks are sealed, and water enters very slowly. Permeability is very slow.

Available water capacity is high. The rooting zone is deep, but clay content tends to impede the movement of air, water, and roots. The erosion hazard is slight, and the soil blowing hazard is moderate.

Included with this soil in mapping are small areas of Lipan soils that have about 25 percent limestone frag-

ments on the surface and throughout the soil. These inclusions make up less than 15 percent of any one mapped area.

This soil is used mainly for range, but a few areas are cultivated. Nonirrigated cotton, grain sorghum, and wheat are the main crops. This soil is not recommended for irrigation.

Potential for growing nonirrigated cotton is high, and potential for nonirrigated grain sorghum and wheat is medium. Keeping crop residue on or near the soil surface helps to prevent soil blowing and conserve moisture. It also helps to improve soil tilth and water intake. In dry years, emergence tillage is needed to help control soil blowing where crop residue does not furnish adequate protection. Farming is hazardous on this soil because of the danger of crops drowning.

This soil has a medium potential for growing native range plants. It is droughty between periods of excessive wetness and produces moderate amounts of forage. Potential for wildlife habitat is medium.

Potential for most urban uses is low. Flooding and shrinking and swelling with changes in moisture, low strength, and corrosivity to uncoated steel are the most restrictive features. Potential for recreational uses is low mainly because of flooding and the clay surface layer. Capability subclass IVw nonirrigated; Lakebed range site.

Ls—Lipan stony clay. This deep, nearly level soil is on bottoms of depressions or shallow playas. Slopes range from 0 to 1 percent but average about 0.5 percent. About 25 to 30 percent loose limestone fragments of cobble and stone size occur on the surface and throughout the soil. This soil is 2 to 15 feet lower than the surrounding soils. Soil areas are circular to oval in shape and range from 10 to 25 acres in size. The surface is characterized by gilgai microrelief consisting of microknolls and microdepressions. The microknolls are 6 to 24 inches higher than the microdepressions and range from 3 to 20 feet apart.

In the center of a microdepression, the surface layer is very firm, moderately alkaline, gray stony clay about 15 inches thick. Limestone cobbles and stones comprise about 30 percent, by volume, of the surface layer. The next layer is very firm, moderately alkaline, grayish brown stony clay about 39 inches thick. Between the

depths of 20 to 40 inches below the surface. These inclusions comprise less than 15 percent of any one mapped area.

This soil is not suitable for cultivation because of limestone cobbles and stones on the surface. It is used mainly for range.

Potential for growing native range plants is medium. This soil is droughty between periods of excess water; therefore, it produces only moderate amounts of forage. Potential for wildlife habitat is low.

Potential for most urban uses is low. Stony surface, flooding, and shrinking and swelling with changes in moisture, low strength, and corrosivity to uncoated steel are the most restrictive features. Potential for recreational uses is low mainly because of flooding and the stony clay surface layer. Capability subclass VIw nonirrigated; Lakebed range site.

MeB—Mereta clay loam, 1 to 3 percent slopes. This shallow, gently sloping soil is on uplands, mainly on outwash plains. Some areas occur as side slopes around playas. Slopes average about 1.5 percent. Areas are irregular in shape and range from 30 to several hundred acres in size.

This soil has a surface layer of friable, moderately alkaline clay loam about 17 inches thick. This layer is dark brown in the upper 7 inches and brown in the lower 10 inches. It has an abrupt boundary underlain by a layer of whitish indurated caliche (fig. 11). This layer is about 18 inches thick. Between the depths of 35 and 60 inches the soil is pink, weakly cemented caliche that has a texture of clay loam.

This soil is well drained. Surface runoff is slow. Permeability is moderately slow, and available water capacity is low. The rooting zone is shallow. The erosion hazard is moderate, and the soil blowing hazard is slight.

Included with this soil in mapping are small areas of Angelo, Conger, and Ector soils. Included soils make up less than 15 percent of any one mapped area.

This soil is suitable for growing nonirrigated crops, but is used mainly for range. It is not suitable for growing irrigated crops.

Potential for growing nonirrigated cotton, grain sorghum, and wheat is medium. If this soil is cultivated,

features. These limitations can be overcome by good design and careful installation procedures. The potential for most recreational uses is medium. The clay loam surface layer is the most limiting feature. Capability subclass IIIe nonirrigated; Shallow range site.

MfA—Midessa fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on upland plains. Slopes average about 0.6 percent. Areas are irregular in shape

average about 2 percent. Areas are irregular in shape and range from 15 to several hundred acres in size.

This soil has a surface layer of very friable, moderately alkaline, brown fine sandy loam about 8 inches thick. The next layer is very friable, moderately alkaline sandy clay loam about 22 inches thick. It is brown in the upper 9 inches and light brown in the lower 13 inches. The next layer is friable, moderately alkaline, pink clay loam about 22 inches thick and is about 40 percent by volume calci-

layer is very friable, moderately alkaline, light brown sandy clay loam about 20 inches thick. Between the depths of 28 and 70 inches, the soil is friable, moderately alkaline, pink clay loam and is about 25 percent, by volume, calcium carbonate.

This soil is well drained. Surface runoff is medium. Permeability is moderate, and available water capacity is medium. The rooting zone is deep. The erosion hazard is severe, and the soil blowing hazard is moderate.

Included with this soil in mapping are Midessa soils that have slopes of 1 to 3 percent and small areas of a soil similar to Midessa fine sandy loam except that it has a slightly sandier surface layer and it does not have accumulations of calcium carbonate in the lower layers. These inclusions make up less than 20 percent of any one mapped area.

This soil is used mainly for range. It can be planted to nonirrigated grain sorghum or wheat. It is not suitable for irrigated crops, nor is it suitable for nonirrigated cotton.

Potential for growing nonirrigated grain sorghum or wheat is low. Low rainfall, slope, and susceptibility to water erosion are the most limiting factors. If the soil is cultivated, it is necessary to keep crop residue on or near the surface to conserve moisture and to help control water erosion and soil blowing. Contour farming, terraces, and grassed waterways are necessary to help control excess runoff. Emergency tillage is needed during dry years, when crop residue does not provide adequate protection. Potential for growing native range plants is high. Good range management is needed to prevent this soil from eroding. Potential for wildlife habitat is medium. This soil has a high potential for most urban uses. Slope, seepage when used for sewage lagoons, low strength when used for streets and roads, and corrosivity to uncoated steel are the most restrictive features. These limitations are easily overcome by good design and careful installation procedures. Potential for recreational uses is high. Slope restricts some playground uses. Capability subclass IVe nonirrigated; Sandy Loam range site.

MoC—Monahans fine sandy loam, 1 to 5 percent slopes. This deep, gently sloping soil is on upland plains. Slopes average about 4 percent. Areas are oblong to irregular in shape and range from 10 to 150 acres in size.

The surface layer of this soil is very friable, moderately alkaline, pale brown fine sandy loam about 6 inches thick. The next layer is very friable, moderately alkaline, very pale brown loam about 11 inches thick. Between the depths of 17 and 36 inches, the soil is very friable, moderately alkaline, pink loam and is about 40 percent, by volume, soft calcium carbonate and gypsum material. Between the depths of 36 and 60 inches, the soil is very friable, moderately alkaline, pink loam.

This soil is well drained. Surface runoff is slow. Permeability is moderate, and available water capacity is medium. The rooting zone is deep, but a high percentage of calcium carbonate and gypsum at 17 inches restricts some root growth. The erosion and soil blowing hazards are moderate.

Included with this soil in mapping are small areas of Cottonwood soils. Also included are small areas of Monahans soils that have slopes of 6 to 8 percent. Inclusions make up less than 15 percent of any one mapped area.

This soil is not suitable for cultivation. Slope, shallow depth to a layer containing calcium carbonate and gypsum, and susceptibility to water erosion and soil blowing restrict use of the soil to range. Potential for growing native range plants is high. Yields of forage are good during favorable years. Potential for wildlife habitat is medium.

This soil has a high potential for most urban uses. Slope, seepage, low strength, and corrosivity to uncoated steel and concrete are the most limiting features. However, these limitations are easily overcome by good design and careful installation procedures. Potential for recreational uses is medium. Slope and the dusty surface layer are the most restrictive features. Capability subclass VIe nonirrigated; Sandy Loam range site.

PaB—Patricia loamy fine sand, 0 to 3 percent slopes. This deep, nearly level to gently sloping soil is on upland plains. Slopes average about 2 percent. Areas are irregular in shape and range from 25 to several hundred acres in size.

This soil has a surface layer of friable, neutral, reddish brown loamy fine sand about 14 inches thick. The next 32 inches consists of friable, neutral, red sandy clay loam. Between the depths of 46 and 80 inches, the soil is friable, mildly alkaline sandy clay loam. It is yellowish red in the upper 18 inches and reddish yellow in the lower 16 inches.

This soil is well drained. Surface runoff is slow. Permeability is moderate, and available water capacity is medium. The rooting zone is deep and is easily penetrated by plant roots. The water erosion hazard is slight, and the soil blowing hazard is severe.

Included with this soil in mapping are small areas of Amarillo, Pyote, and Springer soils. Also included are oblong sandy mounds that are 1 to 3 feet higher than the surrounding soils and 4 to 20 feet wide. They are around the edges of some cultivated fields. Included in areas of range are sandy mounds that are 6 to 12 inches high and 2 to 4 feet in diameter. These areas are around the bases of mesquite trees. Inclusions make up less than 15 percent of any one mapped area.

This soil is used mainly for range, but it can be cultivated. When this soil is cultivated, cotton and grain sorghum are the main crops.

This soil has a high potential for growing nonirrigated and irrigated cotton and grain sorghum. Careful management is needed to prevent soil blowing. Crop residue needs to be left on or near the soil surface, and deep plowing is needed to increase the clay content of the surface layer. Emergency tillage helps control soil blowing when crop residue does not furnish adequate protection. Contour farming, terraces, and grassed waterways help control excess runoff. A properly designed irrigation system and proper application of irrigation water are essential. This soil is suitable only for sprinkler irrigation systems. Fertilizer is needed if this soil is irrigated.

This soil has a high potential for growing native range plants. Native plants are mainly tall grasses, which produce good yields of forage during favorable years. Potential for wildlife habitat is medium.

This soil has a high potential for most urban uses. Seepage and low strength are the most limiting factors. Potential for recreational uses is medium. The loamy fine sand surface layer is the most limiting feature. Capability subclass IVE nonirrigated, IIIe irrigated; Loamy Sand range site.

depth of about 60 inches, is very friable, neutral, reddish yellow loamy fine sand. Between the depths of 60 and 80 inches, the soil is loose, strongly acid, reddish yellow fine sand.

This soil is well drained. Surface runoff is very slow. Permeability is moderately rapid, and available water capacity is low. The rooting zone is deep and is easily penetrated by plant roots. The water erosion hazard is slight, and the soil blowing hazard is severe.

Included with this soil in mapping are small areas of

percent. Inclusions make up less than 15 percent of any one mapped area.

This soil is used as cropland and range. Cotton and grain sorghum are the main crops. Most of the areas in cultivation are irrigated. Nonirrigated cotton does not grow well on this soil.

Potential for growing irrigated cotton and nonirrigated or irrigated grain sorghum is high. Keeping crop residue on or near the soil surface helps protect the soil from water erosion and soil blowing and helps conserve moisture. In dry years, emergency tillage is needed to control soil blowing where crop residue does not provide adequate protection. A properly designed irrigation system and proper application of irrigation water are necessary. A surface or sprinkler system can be used. Fertilizer is needed when this soil is irrigated.

This soil has a medium potential for growing native range plants. Low rainfall limits this soil to moderate yields of mid and short grasses. Potential for wildlife habitat is also medium.

Potential for most urban uses is medium. This soil shrinks and swells with changes in moisture. It is corrosive to uncoated steel, has low strength, and seeps when used for sewage lagoons. Potential for recreational uses is medium. The silty clay loam surface layer is too clayey

medium. Crop residue needs to be left on or near the soil surface to help protect the soil from water erosion and soil blowing. Residue also helps to conserve moisture. In dry years, emergency tillage is needed to control soil blowing where crop residue does not provide adequate protection. Contour farming and terraces are needed on this soil. Grassed waterways make good outlets for terrace systems when excess water is a problem. When cuts or excavations exceed 20 inches, there is a hazard of cutting into soil material that contains concentrations of calcium carbonate. A properly designed irrigation system and proper application of irrigation water are necessary. A sprinkler irrigation system is best adapted. Some bench leveling is needed if a surface irrigation system is used. Fertilizer is needed if this soil is irrigated.

Potential for growing native range plants is medium. Low rainfall limits production of this soil to moderate yields of mid and short grasses during favorable years. Potential for wildlife habitat is medium.

Potential for most urban uses is medium. Shrinking and swelling with changes in moisture, low strength, corrosivity to uncoated steel, and seepage when used for sewage lagoons are the main limiting features. Potential for recreational uses is medium. The silty clay loam surface layer is too clayey and dusty. Slope restricts some

proper application of irrigation water are necessary. A surface or sprinkler system can be used. Fertilizer is needed if this soil is irrigated.

This soil has a high potential for growing native range plants. Low rainfall is the most limiting factor. Potential for wildlife habitat is high.

Included with this soil in mapping are small areas of Patricia soils and Pyote soils. Also included are sandy mounds that are the result of soil blowing. They are along fence rows and around mesquite trees. Inclusions make up less than 15 percent of any one mapped area.

This soil is used mainly for range. It can however if

Included with this soil in mapping are small areas of Mereta soils and Tobosa soils that have slopes of 1 to 2 percent. Also included are a few areas that have large limestone rocks on the surface. These areas comprise up to 20 percent of the mapped area. However, most mapped areas contain less than 15 percent inclusions.

This soil is used mainly for range, but a few areas are cultivated. Nonirrigated cotton, grain sorghum, and wheat are the main crops. Irrigation is not recommended for this soil.

Potential for growing nonirrigated cotton, grain sorghum, and wheat is high. Crop residue left on or near the soil surface helps control water erosion, prevent soil blowing, and conserve moisture. It also helps to improve soil tilth and water intake. In dry years, emergency tillage helps to control soil blowing where crop residue does not furnish adequate protection.

This soil has a medium potential for growing native range plants. It is droughty and produces moderate amounts of forage. Potential for wildlife habitat is medium.

Potential for most urban uses is low. Shrinking and swelling with changes in moisture, low strength, and corrosivity to uncoated steel are the most restrictive features. Potential for recreational uses is low mainly because of the clay surface layer. Capability subclass IIIs nonirrigated; Clay Flat range site.

Planning the Use and Management of the Soils

The soil survey is a detailed analysis and evaluation of the most basic resource of the survey area—the soil. It may be used to fit the use of the land, including urbanization, to the limitations and potentials of the natural resources and the environment and to help avoid soil-related failures in uses of the land.

During a soil survey soil scientists, conservationists, engineers, and others keep extensive notes, not only about the nature of the soils but also about unique aspects of behavior of these soils in the field and at construction sites. These notes include observations of erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic systems, and other factors relating the kinds of soil and their productivity, potentials, and limitations under various uses and management. In this way field experience incorporated with measured data on soil properties and performance is used as a basis for predicting soil behavior.

Information in this section will be useful in applying basic facts about the soils to plans and decisions for use and management of soils for cultivated crops, range, and many nonfarm uses, including building sites, highways and other transportation systems, sanitary facilities, parks and other recreational developments, and wildlife habitat. From the data presented, the potential of each soil for specified land uses may be determined, soil limita-

tions to these land uses may be identified, and costly failures in homes and other structures, because of unfavorable soil properties, may be avoided. A site can be selected where the soil properties are favorable, or practices can be planned that will overcome the soil limitations.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area, and on the environment. Both of these factors are closely related to the nature of the soil. Plans can be made to maintain or create a land use pattern in harmony with the natural soil.

Contractors can find information useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock or cemented layers that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, trees and shrubs, and most other uses of land are influenced by the nature of the soil.

Cultivated Crops

The major management concerns when using the soils for cultivated crops are described in this section. In addition, the crops best adapted to the soils in the survey area are discussed; irrigation is briefly discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the predicted yields of the main crops are presented for each soil.

This section provides information about the overall agricultural potential and needed practices in the survey area for those in the agribusiness sector—equipment dealers, drainage contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section “Soil Maps for Detailed Planning.” When making plans for management systems for individual fields or farms, consider the detailed information given in the description of each soil.

In 1967, about 50,914 acres in the survey area were used for crops, according to “Conservation Needs Inventory” (3).

The most restrictive factor limiting the use of Glasscock County soils for cultivated crops is low rainfall. The potential of the soils for increased production of food is high, but the lack of rainfall and irrigation water restricts use of many of the soils to range.

Other management concerns are the water erosion and soil blowing hazards.

Water erosion is a hazard on the loamy, gently sloping Amarillo, Angelo, Arvana, Broome, Mereta, Midessa, and Reagan soils. Runoff can damage these soils if they are not protected. Vegetative cover and mechanical measures, such as contour farming, terraces, and grassed waterways, help minimize water erosion on these soils.

Soil blowing is a severe hazard on the sandy Patricia and Springer soils. It is a moderate hazard on the loamy or clayey Amarillo, Arvana, Estacado, Lipan, Midessa, Reagan, and Tobosa soils. Soil blowing can damage these soils in a few hours if winds are strong and the soils are dry and bare of vegetation or surface mulch. Maintaining vegetative cover, surface mulch, or rough surfaces, through proper tillage, minimizes soil blowing on these soils.

Loss of the surface layer by water erosion or soil blowing is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils with a clayey subsoil, such as the Angelo soils, and on soils with a layer that limits the depth of the root zone, such as indurated caliche layers in the Arvana soils and Mereta soils. Second, runoff from farmland deposits sediment in streams. Control of water erosion minimizes sedimentation and improves the quality of water for municipal use, for recreation, and for fish and wildlife. Soil blowing pollutes the air and deposits drifts of productive soil material along fence rows, in bar ditches, and across roads.

Erosion control practices provide protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps vegetative cover on the soil for extended periods can hold soil erosion losses to amounts that do not reduce the productive capacity of the soils.

Minimum tillage and leaving crop residue on or near the soil surface help to increase infiltration and to reduce the hazards of runoff and erosion. These practices can be adapted to most soils in the survey area, but are more difficult to use successfully on the soils that have a clayey surface layer, such as the Lipan, Rioconcho, and Tobosa soils.

Deep plowing increases the clay content of the surface layer of the Patricia and Springer soils. An increase in clay content in the surface layer of these sandy soils helps reduce the hazard of soil blowing.

Emergency tillage helps control soil blowing if crop residue does not furnish adequate protection. Tillage is used to roughen the soil surface so that the soil is more resistant to movement by the wind. The Amarillo, Arvana, Estacado, Lipan, Midessa, Patricia, Reagan, Springer, and Tobosa soils are suitable for emergency tillage.

Contour farming is also an erosion control practice used in the survey area. It is best adapted to soils with smooth, uniform slopes, including most areas of the gently sloping Amarillo, Angelo, Arvana, Broome, Mereta, Midessa, Patricia, Reagan, and Springer soils.

Grassed waterways minimize soil erosion by slowing the velocity of runoff. They are also good outlets for terraces or diversions.

Terraces and diversions reduce the length of slope and reduce runoff and erosion. They are more practical on deep, well drained soils that have regular slopes. Amarillo, Midessa, Patricia, and Springer soils are suitable for

terraces. The other soils are less suitable for terraces and diversions because of irregular slopes; a clayey subsoil, which would be exposed in terrace channels, as in Angelo soils; high concentration of calcium carbonate at a depth of less than 30 inches, as in Broome and Reagan soils; or indurated caliche at a depth of less than 30 inches, as in Arvana and Mereta soils.

Information for the design of erosion control practices for each kind of soil is contained in the "technical guide," available in local offices of the Soil Conservation Service.

Soil drainage is a management need on the somewhat poorly drained Lipan soils, which make up about 5,670 acres in the survey area.

Soil fertility is naturally medium to low in most of the cultivated soils on uplands in the survey area. Additions of fertilizer should be based on the results of soil tests, on the need of the crop, and on the expected level of yields. The Agricultural Extension Service can help determine the kinds and amounts of fertilizer to apply. None of the soils require additions of lime.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils that have good tilth are granular and porous.

Most of the soils used for cultivated crops in the survey area are loamy and can be plowed in the fall. However, some of the gently sloping, loamy soils are subject to damaging water erosion if they are plowed in the fall. Also, maintenance of residue on or near the soil surface is important for those soils subject to soil blowing.

The Lipan, Rioconcho, and Tobosa soils are clayey, and tilth is a problem. If they are wet when plowed, they tend to be very cloddy when dry and good seedbeds are difficult to prepare. Fall plowing generally results in good tilth in the spring. Soil blowing is a problem if these soils are left bare.

Field crops suited to the soils and climate of the survey area include cotton, grain sorghum, and wheat. Cotton and grain sorghum are row crops, and wheat is a close-growing crop.

Special crops are vegetables and nursery plants. Many vegetables are especially suited to deep soils that have good natural drainage and that warm up early in the spring. Production is limited mainly by amount of rainfall or availability of irrigation water.

The latest information and suggestions for growing field crops or special crops can be obtained from local offices of the Agricultural Extension Service and the Soil Conservation Service.

Irrigation

A limited number of acres are irrigated in Glasscock County. In 1973, approximately 8,000 acres were irrigated.

The largest irrigated area is in the St. Lawrence Community. Smaller areas occur in the northwestern and northeastern parts of the county.

All water used for irrigation is pumped from deep wells. Most of the wells are 150 to 300 feet deep. These wells produce from 25 to 1,200 gallons per minute.

Both surface irrigation systems and sprinkler irrigation systems are used. In some places, land leveling or land smoothing is necessary before a surface irrigation system can be installed. Row irrigation is used mainly on the nearly level, clayey and loamy soils. Sprinkler irrigation systems are used on the gently sloping, loamy soils and on the nearly level to gently sloping, sandy soils. If a surface system is used on the gently sloping loamy soils, bench leveling is necessary.

Yields of irrigated crops are two to five times greater than yields from nonirrigated crops.

Capability Classes and Subclasses

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or other crops that require special management. This classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range or for engineering purposes.

In the capability system, all kinds of soils are grouped at two levels: capability class and subclass. These levels are defined in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use. (none in the county)

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w*, *s*, or *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use to pasture, range, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is indicated in table 3. All land in the county except borrow pits, gravel pits, urban land, water area, and other miscellaneous areas is included. Data in this table can be used to determine the farming potential of the area.

The capability subclass is identified in the description of each soil mapping unit in the section "Soil Maps for Detailed Planning."

Yields Per Acre

The per acre average yields that can be expected of the principal crops under a high level of management are shown in table 4. In any given year, yields may be higher or lower than those indicated in table 4 because of seasonal variations in rainfall and other climatic factors. Absence of a yield estimate indicates that the crop is not suited to or not commonly grown on the soil or that irrigation of a given crop is not commonly practiced on the soil.

The predicted yields are based mainly on the experience and records of farmers, conservationists, and Extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The latest soil and crop management practices used by many farmers in the county are assumed in predicting the yields. A few farmers may be using more advanced practices and are obtaining average yields higher than those shown in table 4.

The management needed to achieve the indicated yields of the various crops depends upon the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including timing of plowing and

each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

For yields of irrigated crops it is assumed that the irrigation system is adapted to the soils and to the crop grown; that good quality irrigation water is uniformly applied in proper amounts as needed; and that tillage is kept to a minimum.

The predicted yields reflect the relative productive capacity of the soils for each of the principal crops. Yields are likely to increase in the future as new production technology is developed. The relative productivity of a given soil compared to other soils, however, is not likely to change.

Crops other than those shown in table 4 are grown in the survey area, but because their acreage is small, predicted yields for these crops are not included. The local offices of the Soil Conservation Service and the Agricultural Extension Service can provide information about the productivity and management concerns of the soils for these crops.

Range

RUDY J. PEDERSON, range conservationist, Soil Conservation Service, assisted in preparing this section.

Range is land on which the natural potential plant community of the soil is composed of grasses, forbs, and shrubs that are valuable for grazing. About 487,434 acres in the survey area were used for range in 1967, according to "Conservation Needs Inventory" (3). This acreage has been used for the production of native vegetation and is grazed by domestic livestock and deer. Acreage in range and the number of ranches has gradually decreased over the years. At present, there are about 150 ranches and farms producing livestock in the county.

Most of the soils in the county produce a mixture of

Properties that determine the capacity of the soil to supply moisture and plant nutrients have the greatest influence on range plants and their productivity. Soil reaction, soil depth, and available water capacity are also important.

Potential production refers to the amount of herbage that can be expected to grow on well-managed range that is supporting the potential plant community. It is expressed in pounds per acre of air-dry herbage for favorable, normal, and unfavorable years. A favorable year is one in which the amount and distribution of precipitation and the temperatures result in growing conditions substantially better than average; a normal year is one in which these conditions are about average for the area; an unfavorable year is one in which growing conditions are well below average, generally because of low available soil moisture.

Dry weight refers to the total air-dry herbage produced per acre each year by the potential plant community. All herbage, both that which is highly palatable and that which is unpalatable to livestock, is included. Some of the herbage also may be grazed extensively by wildlife and some of it not. Plant species that have special value for livestock forage are mentioned in the description of each soil mapping unit.

Common names are listed for the grasses, forbs, and shrubs that make up most of the potential plant community on each soil. Under the heading Composition in table 5, the proportion of each species is presented as the percentage, in dry-weight, of the total annual production of herbaceous and woody plants. The amount that can be used as forage depends on the kinds of grazing animals and on the season when the forage is grazed. All of the herbage produced is normally not used.

Range management requires, in addition to knowledge of the kind of soil and the potential plant community, an evaluation of the present condition of the range vegetation in relation to its potential production. Range condi-

forbs, and woody plants. Mesquite has increased and in- These factors of soil behavior affect construction and

can be overcome or minimized by special planning and design. A *severe* limitation indicates one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated *severe*, such costly measures may not be feasible.

Shallow excavations are used for pipelines, sewerlines, telephone and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by the soil wetness, the texture and consistence of soils, the tendency of soils to cave in or slough, and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is defined, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and small commercial buildings referred to in table 6 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable so that cracking or subsidence from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity, and soil wetness were also considered. Soil wetness indicates potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious limitation.

Local roads and streets referred to in table 6 have an all-weather surface that can carry light to medium traffic all year. They consist of subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The AASHTO and Unified classifications of the soil and the soil texture, density, and shrink-swell potential, are indicators of the traffic supporting

Sanitary Facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that deal with the ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 7 shows the degree and kind of limitations of each soil for these uses and for use of the soil as daily cover for landfills.

If the degree of soil limitation is indicated by the rating *slight*, soils are favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance are required. The ratings "good," "fair," and "poor" used in the last column of the table, are approximately parallel to the ratings "slight," "moderate," and "severe."

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect the absorption of the effluent are permeability, depth to bedrock, and susceptibility to flooding. Stones, boulders, and a shallow depth to bedrock interfere with installation. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas. Also, soil erosion and soil slippage are hazards where absorption fields are installed in sloping soils.

Some soils are underlain by loose sand or fractured bedrock at a depth less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and as a result ground water supplies in the area may be contaminated.

Percolation tests are performed to determine the absorptive capacity of the soil and its suitability for septic tank absorption fields. These tests should be performed during the season when the water table is highest and the soil is at minimum absorptive capacity.

In many of the soils that have moderate or severe limitations for septic tank absorption fields, it may be possible to install special systems that increase the size of the absorption field so that satisfactory performance is achieved.

nearly impervious soil material. They generally are designed so that depth of the sewage is 2 to 5 feet. Impervious soil at least 4 feet thick for the lagoon floor and sides is required to minimize seepage and contamination of local ground water. Soils that are very high in organic matter and those that have stones and boulders are undesirable. Unless the soil has very slow permeability, contamination of local ground water is a hazard. Slope, depth to bedrock, and susceptibility to flooding also affect the location of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soils affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste either in excavated trenches or on the surface of the soil. The waste is spread, compacted in layers, and covered with thin layers of soil. Landfill areas are subject to heavy vehicular traffic. Ease of excavation, risk of polluting ground water, and trafficability affect the suitability of a soil for this purpose. The best soils have a loamy or silty texture, have moderate or slow permeability, are deep to bedrock, are free of large stones and boulders, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability that might allow noxious liquids to contaminate local ground water.

Unless otherwise stated, the ratings in table 7 apply only to soil properties and features within a depth of about 6 feet. If the trench is deeper, ratings of slight or moderate may not be valid. Site investigation is needed before a site is selected.

In the trench type of landfill, ease of excavation also affects the suitability of a soil for this purpose, so the soil must be deep to bedrock and free of large stones and boulders.

In the area type of sanitary landfill, refuse is placed on the surface of the soil in successive layers. The limitations caused by soil texture, depth to bedrock, and stone content do not apply to this type of landfill. Soil wetness, however, may be a limitation because of difficulty in operating equipment.

Daily cover for sanitary landfill should be soil that is easy to excavate and spread over the compacted fill during both wet and dry weather. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

In addition to these features, the soils selected for final cover of landfills should be suitable for growing plants. In comparison with other horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation

of the borrow areas, such as slope, erodibility, and potential for plant growth.

Construction Materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 8 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed and described as the survey is made, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soil are evaluated as sources of roadfill for low embankments, generally less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material after it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about soil properties that determine such performance is given in the descriptions of soil series.

The ratings apply to the soil profile between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within the profile. The estimated engineering properties in table 12 provide more specific information about the nature of each horizon that can help determine its suitability for roadfill.

According to the Unified soil classification system, soils rated *good* have low shrink-swell potential, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as high shrink-swell potential, steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*, regardless of the quality of the suitable material.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 8 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 12.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly

by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to sustain the growth of plants. Also considered is the damage that would result to the area from which the topsoil is taken.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones, are low in content of gravel and other coarse fragments, and have gentle slopes. They are low in soluble salts, which can limit plant growth. They are naturally fertile or respond well to fertilization. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils; very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is much preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter. Consequently, careful preservation and use of material from these horizons is desirable.

Water Management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 9 the degree of soil limitation and soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Soil and site limitation are expressed as slight,

in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Irrigation is affected by such features as slope, susceptibility to flooding, hazards of water erosion and soil blowing, texture, presence of salts and alkali, depth of root zone, rate of water intake at the surface, permeability of the soil below the surface layer, available water capacity, need for drainage, and depth to the water table.

Terraces and diversions are embankments, or a combination of channels and ridges, constructed across a slope to intercept runoff and allow the water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity of slope and steepness; depth to bedrock or other unfavorable material; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff at nonerosive velocities to outlets. Features that affect the use of soils for waterways are slope, permeability, erodibility, and suitability for permanent vegetation.

Recreation

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for camp areas, picnic areas, playgrounds, and paths and trails. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreational use by the duration of flooding and the season when it occurs. Onsite assessment of height, duration, and frequency of flooding is essential

intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet nor subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderate intensity of management and fairly frequent attention are required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat

Openland habitat consists of croplands, pastures, native grasslands, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kind of wildlife attracted to these areas in

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Information is presented for each of these contrasting horizons. Depth to the upper and lower boundaries of each horizon in a typical profile of each soil is indicated. More information about the

estimates are determined largely by observing volume percentage in the field and then converting it, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter is estimated by passing a sample of four standard sieves is esti-

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others it was estimated on the basis of the kind and amount of clay in the soil and on measurements of

Hydrologic soil groups. Soils are placed in one of four groups on the basis of intake of water at the end of long-duration storms occurring after prior wetting and opportunity for swelling and without the protective effects of vegetation.

The major soil groups are:

A. (Low runoff potential). Soils having high infiltration rates even when thoroughly wetted. These consist chiefly

Engineering Test Data

Table 15 contains the results of engineering tests performed by the Texas Highway Department on some of the soils of Glasscock County. The table shows the specific location where samples were taken, the depth to which sampling was done, and the results of tests to determine particle-size distribution and other properties

cies. The characteristics of the soil at any given point are determined by (1) the physical and mineral composition of the parent materials; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or lay of the land; and (5) the length of time the forces of soil development have acted on the soil material.

Climate and vegetation are active factors of soil genesis. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body with genetically related horizons. The effects of climate and vegetation are conditioned by relief. The parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of the parent material into a soil profile. It may be much or little, but some time is always required for horizon differentiation. Usually a long time is required for the development of distinct horizons.

The factors of soil genesis are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one unless conditions are specified for the other four.

Parent Material

Parent material refers to the unconsolidated mass from which the soil develops. The soils of Glasscock County have developed in residual outwash and alluvial deposits.

The wet climate of past geological ages influenced the deposition of the parent materials. Later, as the soils began to develop, the climate became subhumid. The limited rainfall was not enough to leach the minerals from the soils. As a result, except for the sandy soils, most of the soils are high in fertility. The soils seldom get wet to a depth of more than 6 feet. Consequently, many soils have a horizon of calcium carbonate a few feet below the surface. Most of the young soils have lime throughout the profile.

Summer temperatures are high and winter temperatures are mild. The high temperatures and low rainfall have limited the accumulation of organic matter in the soils.

Plant and Animal Life

Plants, animals, insects, and bacteria are important in the formation of soils. Gains in organic matter and nitrogen in the soil, gains or losses in plant nutrients, and changes in structure and porosity are among the changes caused by living organisms.

Amount and type of vegetation, dominantly grasses, has affected soil formation in Glasscock County more than other living organisms.

Relief

Relief influences soil development through its effect on

Nearly level to gently sloping soils that have been in place for long periods normally show the greatest profile development. In Glasscock County, examples of these soils are Amarillo and Acuff soils. Time is also important in the development of these soils.

Many shallow soils on steep slopes have been in the process of development as long as the well-developed, nearly level soils. Geologic erosion has removed the effects of soil formation on the shallow soils, and such soils have not reached an equilibrium with their environment. Here, relief is the dominant soil-forming factor rather than time. The Conger and Ector soils are examples.

SUBGROUP. Each great group is divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades that have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Aridic Paleustolls.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties con-

Classification of the Soil

Road 33, 3.0 miles west on Farm Road 461, 0.75 mile south on a county road, and 1,850 feet east:

A1—0 to 8 inches; brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; hard, friable, slightly sticky; many fine roots; many fine pores; noncalcareous; neutral; clear smooth boundary.

B21t—8 to 16 inches; reddish brown (5YR 4/3) sandy clay loam, dark reddish brown (5YR 3/3) moist; weak coarse prismatic parting to weak medium subangular blocky structure; hard, friable, slightly sticky; few fine roots; many fine pores; few discontinuous clay films on ped faces; noncalcareous; mildly alkaline; gradual smooth boundary.

B22t—16 to 23 inches; reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; weak coarse prismatic parting to weak medium subangular blocky structure; hard, friable, slightly sticky; few fine roots; many fine pores; nearly continuous clay films on prism faces and patchy clay films on ped faces; few films of calcium carbonate in lower part; noncalcareous; mildly alkaline; gradual wavy boundary.

B23t—23 to 45 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak coarse prismatic parting to weak medium subangular blocky structure; hard, friable, slightly sticky; thin discontinuous clay films on prism faces and ped faces; few films and threads of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

B24tca—45 to 66 inches; reddish yellow (5YR 7/6) sandy clay loam, red-

B21t—8 to 18 inches; reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; weak coarse prismatic parting to weak fine and medium subangular blocky structure; hard, friable, slightly sticky; common roots; many pores; thin discontinuous clay films on prism faces and patchy clay films on peds; noncalcareous; mildly alkaline; clear smooth boundary.

B22t—18 to 34 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak coarse prismatic parting to weak medium subangular blocky structure; hard, friable, slightly sticky; few roots; common pores; nearly continuous clay films on prism faces and patchy clay films on peds; noncalcareous; mildly alkaline; gradual smooth boundary.

B23t—34 to 52 inches; reddish yellow (5YR 6/6) sandy clay loam, yellowish red (5YR 5/6) moist; weak coarse prismatic parting to weak fine to medium subangular blocky structure; hard, friable, slightly sticky; common pores; few films and threads of calcium carbonate; few patchy clay films on peds; calcareous; moderately alkaline; gradual wavy boundary.

B24tca—52 to 64 inches; pink (5YR 8/4) sandy clay loam, pink (5YR 7/4) moist; weak coarse prismatic parting to weak fine subangular blocky structure; hard, friable, slightly sticky; many soft masses and weakly cemented concretions of calcium carbonate comprising about 30 percent by volume; calcareous; moderately alkaline; diffuse wavy boundary.

B25t—64 to 80 inches; reddish yellow (5YR 7/6) sandy clay loam, reddish yellow (5YR 6/6) moist; weak fine subangular blocky structure; hard, friable, slightly sticky; few patchy clay films and sand grains

B22—26 to 34 inches; reddish brown (5YR 5/4) silty clay, reddish brown (5YR 4/4) moist; moderate fine and medium blocky structure; hard, firm, sticky; few visible soft masses and weakly cemented concretions of calcium carbonate comprising about 1 to 2 percent by volume; calcareous; moderately alkaline; gradual wavy boundary.

B23ca—34 to 47 inches; pink (5YR 8/4) silty clay, pink (5YR 7/4) moist; weak medium subangular blocky structure; hard, friable, sticky; many soft visible masses and weakly cemented concretions of calcium carbonate comprising 25 percent by volume; calcareous; moderately alkaline; diffuse wavy boundary.

B24ca—47 to 80 inches; reddish yellow (5YR 7/6) silty clay, reddish yellow (5YR 6/6) moist; weak medium subangular blocky structure; hard, friable, sticky; common visible soft masses and weakly cemented concretions of calcium carbonate comprising about 15 percent by volume; inside of peds are red; calcareous; moderately alkaline.

The solum ranges from 60 to more than 80 inches in thickness. It is moderately alkaline throughout. Depth to the calcic horizon ranges from 24 to 39 inches.

The A horizon ranges from 10 to 19 inches in thickness. It is brown, dark brown, grayish brown, reddish brown, or dark grayish brown. The A12 horizon is clay loam, silty clay loam, clay, or silty clay.

The B2 horizons are clay loam, silty clay loam, clay, or silty clay with clay content of 35 to 55 percent. The B2 horizon above the calcic horizon is reddish brown or brown. The B2ca horizon is pink, reddish yellow, or yellowish red. Soft masses and weakly cemented concretions of calcium carbonate comprise 15 to 55 percent, by volume, of the B2ca horizon.

Arvana Series

The Arvana series consists of moderately deep, loamy soils on uplands. These soils formed in thick accumulations of loamy caliche that is indurated in the upper part. Slope ranges from 1 to 3 percent.

Typical pedon of Arvana fine sandy loam, 1 to 3 percent slopes, in range; from the intersection of Texas Highway 158 and Ranch Road 33 in Garden City, 10.5 miles north on Ranch Road 33, 6.0 miles west on a county road, 1.0 mile south, 1.0 mile west, 1.0 mile north, 0.4 mile west, 7.2 miles north, 3.0 miles west, and 125 feet northeast:

A1—0 to 9 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak fine granular structure; hard, very friable, nonsticky; many very fine roots; many fine pores; neutral; clear smooth boundary.

B21t—9 to 20 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky structure; hard, friable, slightly sticky; common fine roots; many fine pores; nearly continuous clay films on prism faces and patchy clay films on ped faces; noncalcareous; neutral; gradual smooth boundary.

B22t—20 to 28 inches; red (2.5YR 4/6) sandy clay loam, dark red (2.5YR 3/6) moist; weak coarse prismatic parting to weak medium subangular blocky structure; hard, friable, slightly sticky; many fine pores; nearly continuous clay films on prism faces and patchy clay films on ped faces; noncalcareous; mildly alkaline; abrupt wavy boundary.

B23cam—28 to 40 inches; pinkish white (5YR 8/2) indurated plates of caliche with a laminar upper surface layer 1/8-inch thick; calcareous; moderately alkaline; gradual wavy boundary.

B24ca—40 to 70 inches; pinkish white (5YR 8/2) loam, pinkish gray (5YR 7/2) moist; weak fine subangular blocky structure; hard, friable; about 70 percent calcium carbonate; calcareous; moderately alkaline.

Thickness of the solum or depth to the B2cam horizon ranges from 20 to 36 inches.

The A horizon ranges from 6 to 12 inches in thickness. It is reddish brown or brown. It is neutral through moderately alkaline.

The B2t horizon is sandy clay loam, clay loam, loam, or fine sandy loam, with clay content of 18 to 35 percent. It is reddish brown, yellowish red, or red. It is neutral to moderately alkaline.

The B2cam horizon ranges from 6 to 18 inches in thickness. It is indurated to strongly cemented caliche.

The B2ca horizon is loam, clay loam, or sandy clay loam. It contains 45 to 70 percent, by volume, calcium carbonate. It is white, pink, or pinkish white.

Bippus Series

The Bippus series consists of deep, loamy soils on uplands. These soils formed in calcareous, loamy sediment on outwash fans and in colluvial valley fill. Slope ranges from 0 to 1 percent.

Typical pedon of Bippus clay loam, 0 to 1 percent slopes, in range; from the intersection of Ranch Road 33 and Texas Highway 158 in Garden City, 13.2 miles west on Texas Highway 158, 5.9 miles south on Texas Highway 137, 1.8 miles west on a county road, 0.4 mile north on oil field road, and 25 feet west:

A11—0 to 12 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; hard, friable, sticky; many roots; many fine pores; calcareous; moderately alkaline; gradual smooth boundary.

A12—12 to 24 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; weak coarse prismatic parting to moderate fine and medium subangular blocky structure; hard, friable, sticky; many roots; many fine pores; many wormcasts; calcareous; moderately alkaline; gradual smooth boundary.

B21b—24 to 56 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; weak coarse prismatic parting to moderate fine and medium subangular blocky structure; hard, friable, sticky; common roots; many pores; few very fine weakly cemented concretions and films and threads of calcium carbonate comprising about 2 percent by volume; calcareous; moderately alkaline; gradual smooth boundary.

B22b—56 to 62 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; weak fine subangular blocky structure; hard, friable, sticky; few very fine weakly cemented concretions of calcium carbonate; calcareous; moderately alkaline.

The solum ranges from 50 to more than 62 inches in thickness. Thickness of the mollic epipedon ranges from 22 to 28 inches.

The A horizon ranges from 16 to 32 inches in thickness. It is dark grayish brown, very dark grayish brown, dark brown, grayish brown, or brown. It is mildly alkaline or moderately alkaline.

The B2b horizon is clay loam, sandy clay loam, or loam with clay content of 20 to 35 percent in the control section. The B21b horizon is brown, dark brown, grayish brown, or dark grayish brown. The B22b horizon is reddish brown, light brown, brown, or yellowish red.

Blakeney Series

The Blakeney series consists of shallow, loamy soils on uplands. These soils formed in loamy caliche materials that are indurated in the upper part. Slope ranges from 1 to 3 percent.

Typical pedon of Blakeney fine sandy loam, 1 to 3 percent slopes, in range; from the intersection of Ranch Road 33 and Texas Highway 158 in Garden City, 13.2 miles west on Texas Highway 158, 5.9 miles south on Texas Highway 137, 5.25 miles west on county road, and 530 feet north:

A1—0 to 5 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak fine granular and weak fine subangular

blocky structure; slightly hard, friable, slightly sticky; many fine roots; many fine pores; calcareous; moderately alkaline; gradual smooth boundary.

B2—5 to 13 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak fine subangular blocky structure; hard, friable, slightly sticky; common fine roots; many fine pores; few weakly cemented concretions of visible calcium carbonate comprising less than 2 percent by volume; calcareous; moderately alkaline; clear smooth boundary.

Ccam—13 to 35 inches; whitish indurated caliche in broken layers 1 to 4 inches thick; laminar in upper 1/4 inches; calcareous; moderately alkaline; gradual wavy boundary.

Cca—35 to 60 inches; pinkish white (7.5YR 8/2) loamy earth of about clay loam texture; platy; weakly cemented caliche; calcareous; moderately alkaline.

The solum ranges from 12 to 18 inches in thickness.

The A horizon ranges from 5 to 8 inches in thickness. It is brown, pale

Conger Series

The Conger series consists of shallow, loamy soils on uplands. These soils formed in calcareous, loamy materials, the upper part of which is indurated caliche. Slope ranges from 1 to 5 percent.

Typical pedon of Conger clay loam, 1 to 5 percent slopes, in range; from the intersection of Ranch Road 33 and Texas Highway 158 in Garden City, 1.4 miles west on Texas Highway 158, 1.0 mile south on a county road, 0.4 mile west, and 75 feet south:

A1—0 to 5 inches; brown (7.5YR 5/2) clay loam, brown (7.5YR 4/2) moist; weak fine granular and weak fine subangular blocky structure; slightly hard, friable, slightly sticky; many fine roots; many fine pores; few fine concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

In some pedons, the solum is slightly thicker than 12 inches over gypsum.

Ector Series

The Ector series consists of shallow or very shallow, loamy soils on uplands. These soils formed in limestone deposits on plateaus and erosional landscapes. Slope ranges from 1 to 40 percent.

Typical pedon of Ector gravelly clay loam in an area of Ector association, undulating, in range; from the intersection of Ranch Road 33 and Texas Highway 158 in Garden City, 7.4 miles southeast on Texas Highway 158, 3.7 miles north on a county road, 0.57 mile north on oilfield road, and 25 feet east:

A1—0 to 9 inches; dark brown (10YR 4/3) gravelly clay loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, friable, slightly sticky; common fine roots; many limestone fragments about 1 to 4 inches in diameter comprising about 50 percent by volume; the limestone fragments in the lower half of the horizon are coated with secondary carbonates on the lower side; calcareous; moderately alkaline; abrupt irregular boundary.

R&Cca—9 to 19 inches; fractured hard limestone with hardness of about 4 Mohs' scale; coatings of calcium carbonate on surface; cracks and fractures are filled and partly sealed with reprecipitated calcium carbonate; gradual wavy boundary.

R—19 to 40 inches; fractured limestone bedrock; few seams of calcium carbonate in partings in upper part.

Thickness of the solum or depth to the limestone bedrock ranges from 4 to 20 inches.

The A horizon is brown, dark brown, dark grayish brown, or very dark grayish brown. Limestone fragments comprise 35 to 75 percent, by volume, of the A horizon.

The R&Cca horizon ranges from 6 to 12 inches in thickness.

The R layer is several feet thick.

Estacado Series

The Estacado series consists of deep, loamy soils on uplands. These soils formed in calcareous, loamy, eolian sediment. Slope ranges from 0 to 1 percent.

Typical pedon of Estacado clay loam, 0 to 1 percent slopes, in a cultivated field; from the intersection of Texas Highway 158 and Ranch Road 33 in Garden City, 14.6 miles north on Ranch Road 33, 1.27 miles west on Farm Road 461, and 4,170 feet north:

Ap—0 to 8 inches; brown (7.5YR 4/3) clay loam, dark brown (7.5YR 3/3) moist; weak fine granular and subangular blocky structure; hard, friable, slightly sticky; few fine pores; calcareous; moderately alkaline; abrupt smooth boundary.

A1—8 to 16 inches; brown (7.5YR 4/2) clay loam, dark brown (7.5YR

threads, soft masses, and weakly cemented concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

B23tca—36 to 60 inches; pink (5YR 8/4) clay loam, pink (5YR 7/4) moist; weak coarse prismatic parting to weak fine subangular blocky structure; hard, friable, sticky; many soft masses and weakly cemented concretions of calcium carbonate comprising about 45 percent by volume; calcareous; moderately alkaline; diffuse boundary.

B24tca—60 to 80 inches; reddish yellow (5YR 7/6) clay loam, reddish yellow (5YR 6/6) moist; weak coarse prismatic parting to weak fine subangular blocky structure; hard, friable, sticky; few patchy clay films; many soft masses and weakly cemented concretions of calcium carbonate comprising about 30 percent by volume; calcareous; moderately alkaline.

The solum ranges from 60 to more than 80 inches in thickness. It is moderately alkaline throughout. Depth to the calcic horizon ranges from 13 to 19 inches.

The A horizon is brown, dark brown, or dark grayish brown.

The B2tca horizon is clay loam or sandy clay loam with clay content of 18 to 28 percent. Calcium carbonate comprises 5 to 50 percent, by volume, of this horizon. The B2tca horizon is brown, light brown, light reddish brown, reddish yellow, or pink.

Lipan Series

The Lipan series consists of deep, clayey soils that occupy the bottoms of enclosed depressions or intermittent lakes (playas). These soils formed in calcareous, clayey sediment. They crack when dry and have gilgai microrelief. Some areas are stony. Slope ranges from 0 to 1 percent.

Typical pedon of Lipan clay, depressional, at the center of a microdepression, in range; from the intersection of Texas Highway 158 and Ranch Road 33 in Garden City, 7.5 miles south on Ranch Road 33, and 530 feet east:

A1—0 to 22 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; moderate fine and medium blocky structure; very hard, very firm, very sticky and plastic; many roots in upper 10 inches; peds have shiny pressure faces; calcareous; moderately alkaline; gradual smooth boundary.

AC—22 to 55 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; moderate medium blocky structure; very hard, very firm, very sticky and plastic; few very fine roots; few slickensides; shiny pressure faces on peds; few very fine concretions of calcium carbonate comprising 1 percent by volume; calcareous; moderately alkaline; gradual wavy boundary.

Cca—55 to 70 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; massive; very hard, very firm, very sticky and plastic; few to common soft masses and concretions of calcium carbonate comprising 2 to 4 percent by volume; calcareous; moderately alkaline.

The solum ranges from 40 to 63 inches thick. It is mildly alkaline or

The pedons, in some areas, have about 25 to 30 percent loose limestone fragments on the surface and throughout the solum. Limestone fragments are of cobble and stone size, ranging from 3 inches to 4 feet or more across.

Mereta Series

The Mereta series consists of shallow, loamy soils on uplands. These soils formed in loamy caliche that is indurated in the upper part. Slope ranges from 1 to 3 percent.

um carbonate; calcareous; moderately alkaline; gradual wavy boundary.

B23ca—34 to 58 inches; pink (7.5YR 8/4) clay loam, pink (7.5YR 7/4) moist; weak fine subangular blocky structure; hard, friable, sticky; many soft masses and weakly cemented concretions of calcium carbonate comprising about 45 percent by volume; calcareous; moderately alkaline; diffuse wavy boundary.

C—58 to 80 inches; light reddish brown (5YR 6/4) clay loam, reddish brown (5YR 5/4) moist; massive; hard, friable, sticky; many soft masses and weakly cemented concretions of calcium carbonate com-

slopes, in range; from the intersection of Ranch Road 33 and Texas Highway 158 in Garden City, 7.4 miles southeast on Texas Highway 158, 7.5 miles north and east on a county road, and 40 feet southeast:

A11—0 to 7 inches; dark brown (7.5YR 4/3) clay loam, dark brown (7.5YR 3/3) moist; weak fine granular and weak fine subangular blocky structure; hard, friable, sticky; many fine roots; many fine pores; few caliche fragments; calcareous; moderately alkaline; clear smooth boundary.

A12—7 to 17 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; moderate fine subangular blocky structure; hard, friable, sticky; common fine roots; common fine pores; few caliche fragments in lower part; calcareous; moderately alkaline; abrupt wavy boundary.

C1cam—17 to 35 inches: whitish indurated caliche in broken layers 1 to

The solum ranges from 40 to 74 inches in thickness. It is moderately alkaline throughout. Depth to the calcic horizon ranges from 20 to 40 inches.

The A horizon ranges from 7 to 12 inches in thickness. It is brown, light brown, pale brown, or grayish brown.

The B2 horizon is loam, sandy clay loam, or clay loam with clay content of 20 to 35 percent. It is brown, light brown, pale brown, grayish brown, or light brownish gray.

The B23ca horizon is sandy clay loam or clay loam. It is pink, light brown, very pale brown, or pinkish white. Calcium carbonate comprises 15 to 50 percent, by volume, of this horizon.

The C horizon is loam, sandy clay loam, or clay loam. It is pink, light reddish brown, or light brown.

Monahans Series

The Monahans series consists of deep, loamy soils on

Patricia Series

The Patricia series consists of deep, sandy soils on uplands. These soils formed in loamy sediment of outwash and eolian origin. Slope ranges from 0 to 3 percent.

Typical pedon of Patricia loamy fine sand, 0 to 3 percent slopes, in range; from the intersection of Ranch Road 33 and Texas Highway 158 in Garden City, 13.2 miles west on Texas Highway 158, 7.65 miles north on Texas Highway 137, and 1.44 miles east:

A1—0 to 14 inches; reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4) moist; weak fine granular structure; hard, friable, nonsticky; many fine roots; many pores; noncalcareous; neutral; clear smooth boundary.

B21t—14 to 24 inches; red (2.5YR 4/6) sandy clay loam, dark red (2.5YR 3/6) moist; weak coarse prismatic parting to weak medium subangular blocky structure; hard, friable, slightly sticky; many roots; many pores; nearly continuous clay films on prism faces; discontinuous clay films on ped faces; noncalcareous; neutral; gradual smooth boundary.

B22t—24 to 46 inches; red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; weak coarse prismatic parting to moderate fine and medium subangular blocky structure; hard, friable, slightly sticky; common roots; many pores; nearly continuous clay films on prism faces; discontinuous clay films on peds; noncalcareous; neutral; gradual smooth boundary.

B23t—46 to 64 inches; yellowish red (5YR 5/8) sandy clay loam, yellowish red (5YR 4/8) moist; weak coarse prismatic parting to moderate fine and medium subangular blocky structure; hard, friable, slightly sticky; common pores; nearly continuous clay films on prism faces; discontinuous clay films on peds; noncalcareous; mildly alkaline; gradual smooth boundary.

B24t—64 to 80 inches; reddish yellow (5YR 6/8) sandy clay loam, yellowish red (5YR 5/8) moist; weak coarse prismatic parting to weak fine subangular blocky structure; hard, friable, slightly sticky; discontinuous clay films on ped faces; few films and soft masses of calcium carbonate; noncalcareous; mildly alkaline.

The solum ranges from 60 to more than 80 inches thick.

The A horizon ranges from 9 to 20 inches in thickness. It is light brown, brown, or reddish brown. It is neutral or mildly alkaline.

C1ca—7 to 19 inches; white (10YR 8/2) slightly platy caliche which has a hardness of slightly less than 3 Mohs' scale, but can be cut with a spade; plates are fractured in places allowing some roots to penetrate; calcareous; moderately alkaline; gradual wavy boundary.

C2ca—19 to 30 inches; white (10YR 8/2) loamy material that contains about 60 percent caliche fragments and soft powdery caliche.

Thickness of the solum or depth to the Cca horizon ranges from 4 to 10 inches. It is moderately alkaline throughout.

The A horizon is brown, pale brown, light brown, grayish brown, or light brownish gray.

The Cca horizon is white caliche that is slightly platy in the upper part.

Pyote Series

The Pyote series consists of deep, sandy, soils on uplands. These soils formed in sandy unconsolidated sediment of eolian or outwash origin. Slope ranges from 0 to 5 percent.

Typical pedon of Pyote fine sand, 0 to 5 percent slopes, in range; from the intersection of Ranch Road 33 and Texas Highway 158 in Garden City, 13.2 miles west on Texas Highway 158, 6.3 miles north on Texas Highway 137, and 2.05 miles east:

A11—0 to 6 inches; brown (7.5YR 5/4) fine sand, brown (7.5YR 4/4) moist; single grained; loose; many roots; noncalcareous; slightly acid; clear smooth boundary.

A12—6 to 26 inches; light brown (7.5YR 6/4) fine sand, brown (7.5YR 5/4) moist; single grained; loose; few roots; noncalcareous; slightly acid; clear smooth boundary.

B2t—26 to 46 inches; reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 5/6) moist; weak coarse prismatic parting to weak fine subangular blocky structure; loose, very friable, nonsticky; few of the sand grains are bridged with clay films; noncalcareous; slightly acid; gradual smooth boundary.

B3—46 to 60 inches; reddish yellow (5YR 6/8) loamy fine sand, yellowish red (5YR 5/8) moist; weak coarse prismatic parting to weak fine subangular blocky structure; loose, very friable, nonsticky; noncalcareous; neutral; diffuse wavy boundary.

The B2t horizon is red, yellowish red, reddish yellow, or reddish brown. It is sandy clay loam with clay contents of 20 to 35 percent. It is neutral through moderately alkaline.

When a calcic horizon occurs, it is below 60 inches.

Potter Series

The Potter series consists of very shallow, loamy soils

C—60 to 80 inches; reddish yellow (7.5YR 7/6) fine sand, reddish yellow (7.5YR 6/6) moist; single grained; loose; noncalcareous; strongly acid.

The solum ranges from 40 to 80 inches in thickness.

The A horizon ranges from 20 to 40 inches in thickness. It is light reddish brown, reddish brown, light brown, or brown. It is slightly acid through mildly alkaline.

The B horizon is reddish yellow, reddish brown, and brown yellowish red.

Typical pedon of Reagan silty clay loam, 0 to 1 percent slopes, in range; from the intersection of Texas Highway 158 and Ranch Road 33 in Garden City, 9.7 miles south on

A12—16 to 42 inches; dark brown (10YR 4/3) silty clay, dark brown (10YR 3/3) moist; moderate medium blocky structure; very hard, very firm, very sticky and plastic; common fine roots; few very fine pores; common pressure faces; few lenses of very dark grayish

30 feet south:

A11—0 to 4 inches; dark brown (7.5YR 4/2) silty clay loam, dark brown (7.5YR 3/2) moist; weak fine granular and weak fine subangular blocky structure; hard, friable, sticky; many fine roots; many fine pores; light brownish gray (10YR 6/2) surface crust about 1/8 inch thick; calcareous; moderately alkaline; clear smooth boundary.

A12—4 to 10 inches; brown (7.5YR 5/2) silty clay loam, dark brown (7.5YR 4/2) moist; weak coarse prismatic parting to weak medium subangular blocky structure; hard, friable, sticky; common fine roots; many fine pores; few films and thread of visible calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

B21—10 to 19 inches; brown (7.5YR 5/4) silty clay loam, brown (7.5YR 4/4) moist; weak coarse prismatic parting to weak medium subangular blocky structure; hard, friable, sticky; common fine roots; common pores; few films, threads, and weakly cemented concretions of visible calcium carbonate; calcareous; moderately alkaline; gradual

carbonate; calcareous; moderately alkaline; gradual smooth boundary.

B21—42 to 52 inches; brown (10YR 5/3) silty clay, brown (10YR 4/3) moist; moderate medium blocky structure; very hard, very firm, very sticky and plastic; few fine roots; few pressure faces; few common threads and soft masses of visible calcium carbonate comprising 2 to 5 percent by volume; calcareous; moderately alkaline; gradual wavy boundary.

B22—52 to 62 inches; brown (10YR 5/3) silty clay, brown (10YR 4/3) moist; moderate medium blocky structure; hard, firm, sticky and plastic; few fine roots; few fine pores; few pressure faces; calcareous; moderately alkaline; diffuse wavy boundary.

C—62 to 80 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; hard, friable, sticky and plastic; few fine pores; thin lenses of pale brown (10YR 6/3) material; calcareous; moderately alkaline.

Springer Series

The Springer series consists of deep, sandy soils on uplands. These soils formed in noncalcareous to calcareous, loamy sediments of outwash or eolian origin. Slope ranges from 0 to 3 percent.

Typical pedon of Springer loamy fine sand, 0 to 3 percent slopes, in range; from the intersection of Ranch Road 33 and Texas Highway 158 in Garden City, 13.2 miles west on Texas Highway 158, 10.1 miles north on Texas Highway 137, and 1.17 miles east:

A1—0 to 17 inches; brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; single grained, loose, very friable, nonsticky, common

masses and strongly cemented concretions up to 1 inch in diameter of calcium carbonate comprising about 20 percent by volume; calcareous; moderately alkaline.

The solum ranges from 40 to more than 60 inches in thickness.

In undisturbed areas, gilgai microrelief consists of microflats with microdepressions that are 4 to 20 inches deep and 2 to 4 feet wide. When the soil is dry, cracks as wide as 1 inch extend from the surface into the AC horizon. Intersecting slickensides begin at depths of about 20 to 30 inches.

The A horizon ranges from 16 to 30 inches in thickness. It is dark brown, dark grayish brown, or very dark grayish brown. It is mildly alkaline or moderately alkaline.

The AC horizon is clay or silty clay with clay content of 35 to 55 percent. It is brown, dark brown, grayish brown, or dark grayish brown. It

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils com-

less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Typically, the microrelief of Vertisols—clayey soils having a high

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation im-

Range condition. The health or productivity of forage plants on a given range, in terms of the potential productivity under normal climate and the best practical management. Condition classes generally recognized are—*excellent*, *good*, *fair*, and *poor*. The classification is based on the percentage of original, or assumed climax vegetation on a site, as compared to what has been observed to grow on it when well managed.

Range site. An area of range where climate, soil, and relief are sufficiently uniform to produce a distinct kind and amount of native vegetation.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and

sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.005 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt*, *silt loam*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Wind erodibility groups. Soils are grouped according to the following distinctions:

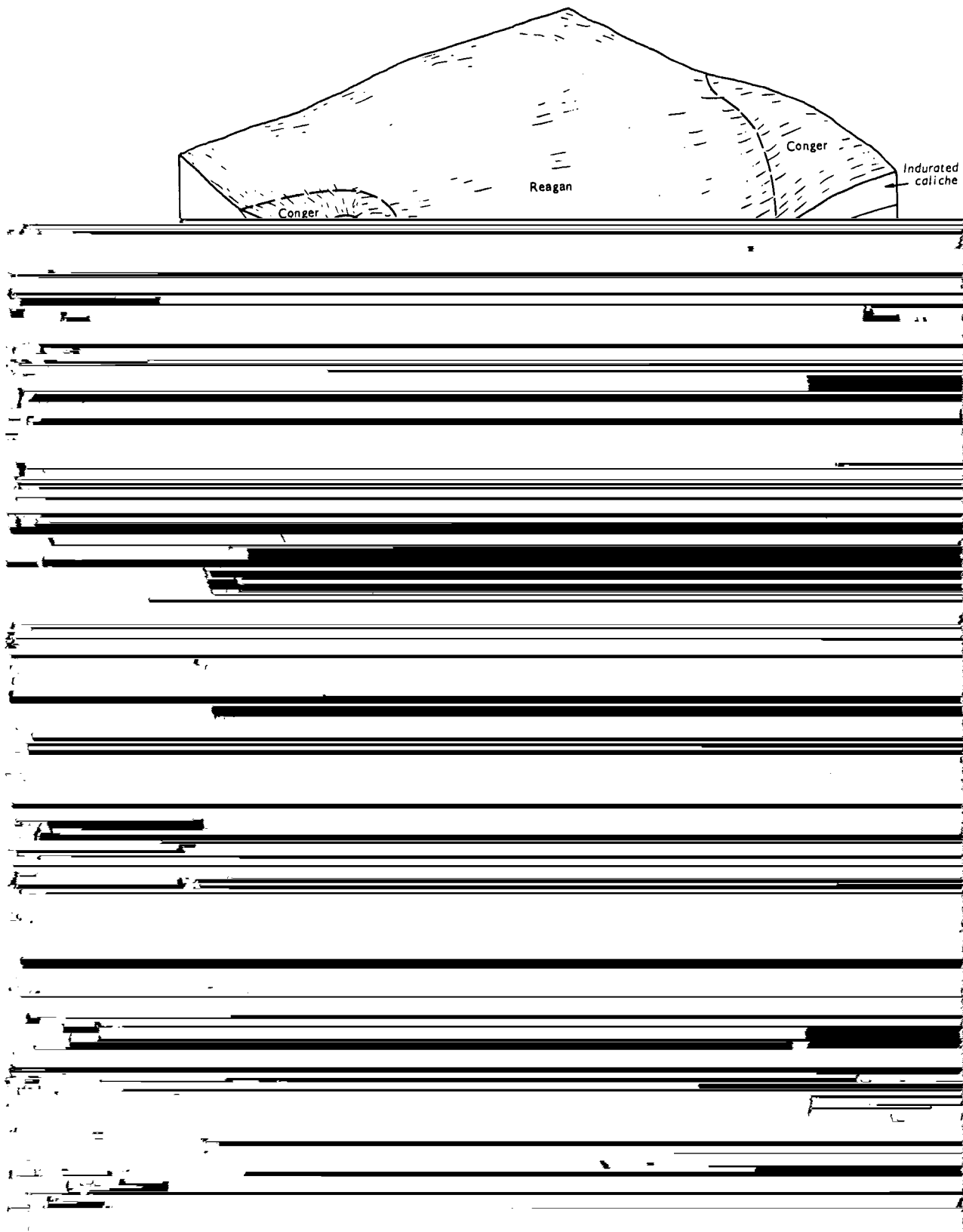
1. *All sands, coarse sands, fine sands, and very fine sands. Extremely erodible; vegetation difficult to establish; generally not suitable for cropland.*

2. All loamy sands, loamy fine sands, and loamy very fine sands.
Very highly erodible; crops can be grown using intensive practices

percent finely divided calcium carbonate, and all sandy clay loams
and sandy clays with less than 5 percent finely divided calcium
carbonate. Slightly erodible; crops can be grown using practices to

Illustrations

SOIL SURVEY



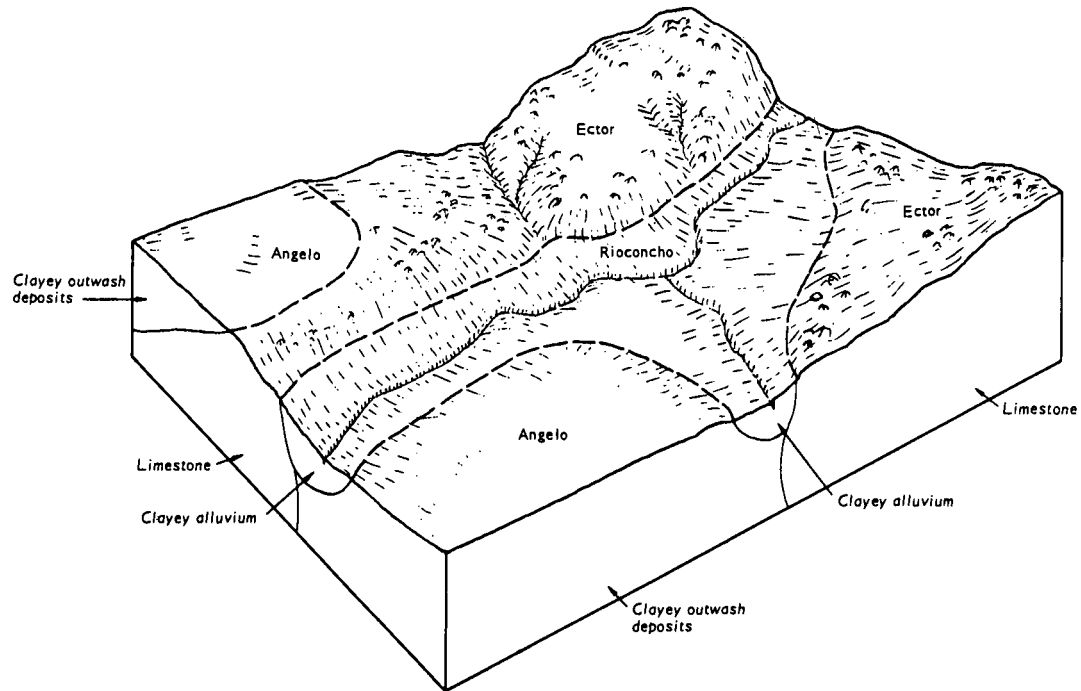


Figure 3.—Typical pattern of soils in the Ector association.

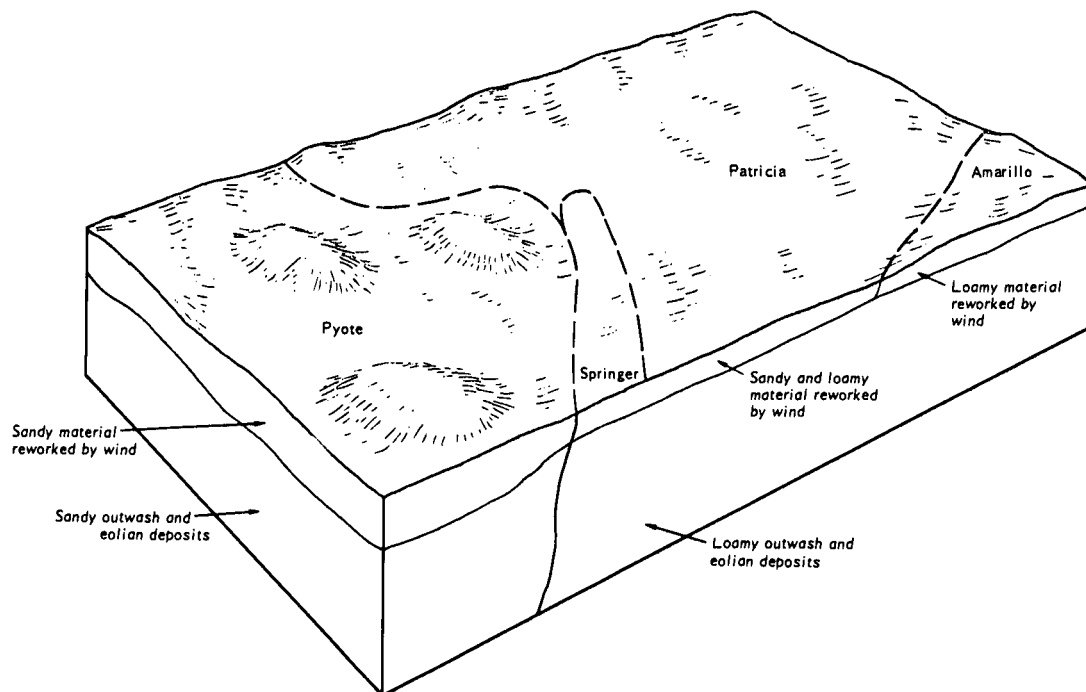


Figure 4.—Typical pattern of soils in the Patricia-Pyote association.



FIGURE 2. Profile of Amesbury silty clay loam.

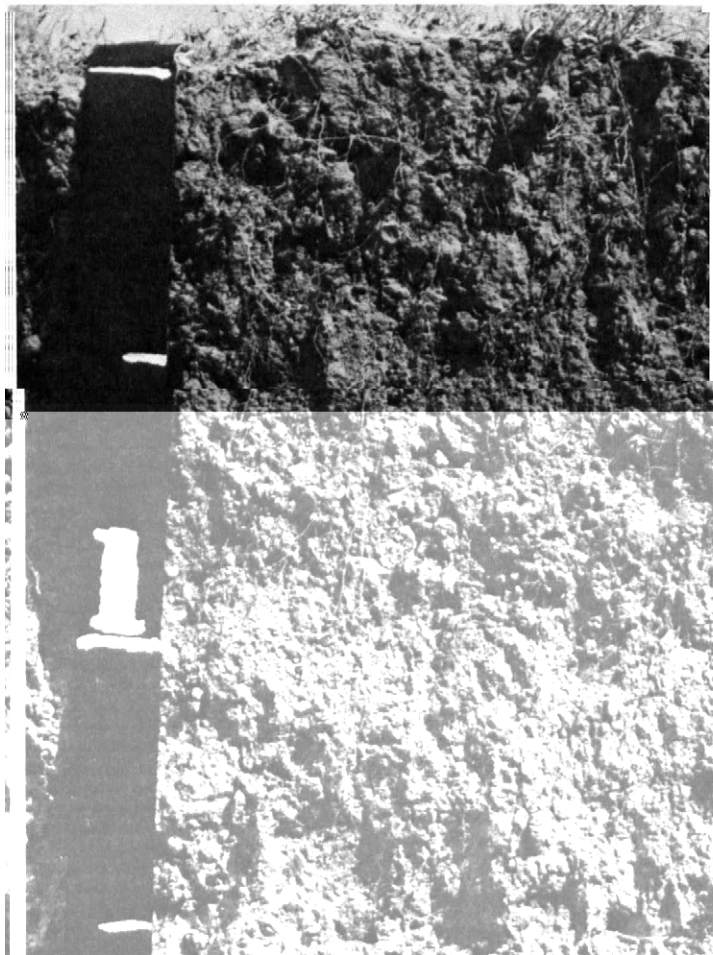


Figure 7.—Profile of Broome clay loam that has concentration of calcium carbonate at depth of about 19 inches.

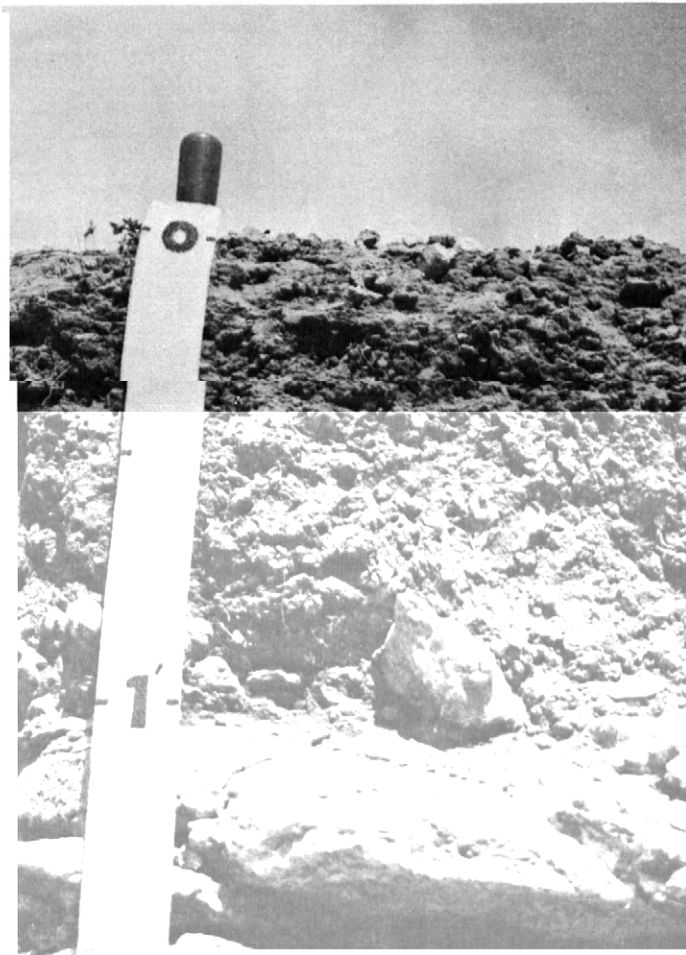


Figure 8.—Profile of Conger clay loam. Layer of whitish indurated caliche begins at depth of about 12 inches rather than the typical 18 inches.



Figure 9.—Profile of Ector gravelly clay loam in an area of Ector association, undulating.



Figure 10.—Area of Ector association, undulating, in Limestone Hill range site. Rocky slopes and low forage potential are characteristic.

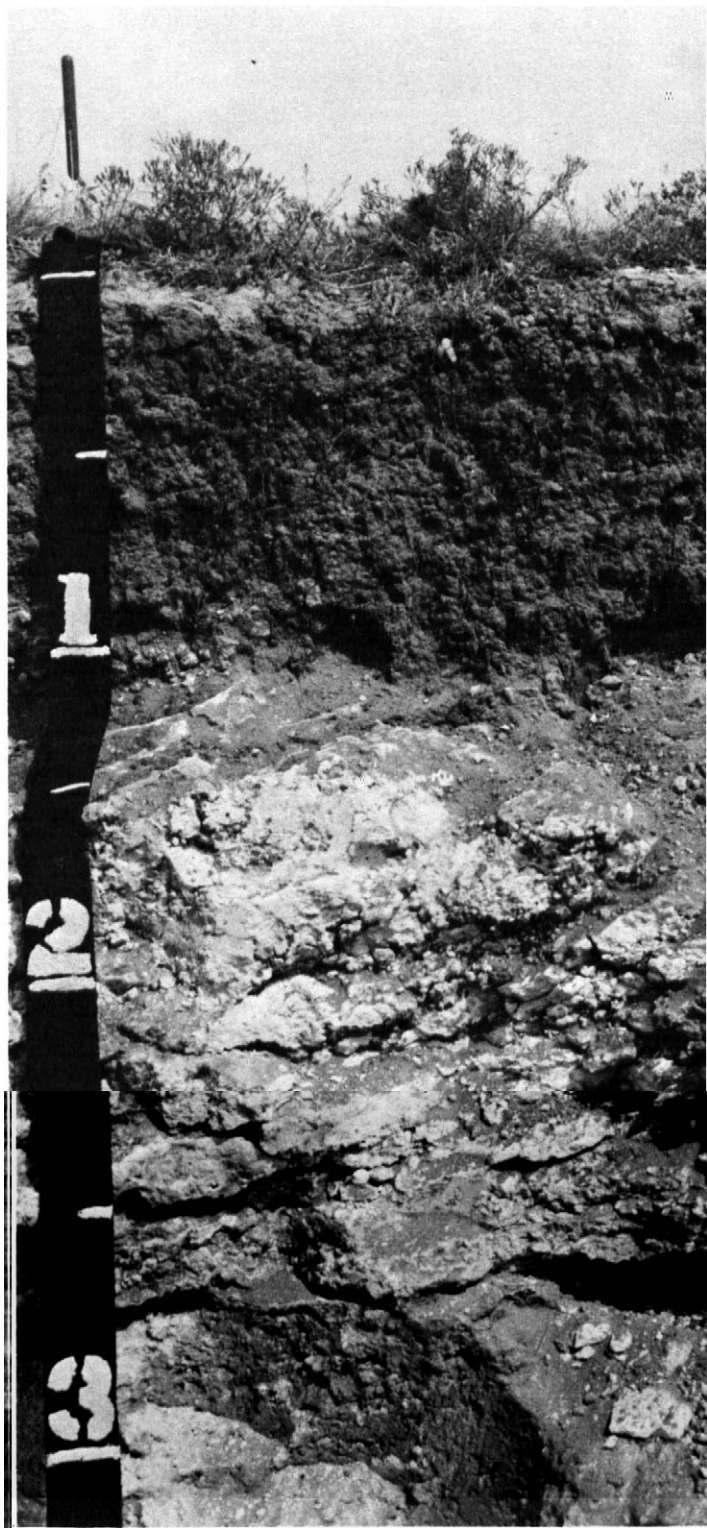


Figure 11.—Profile of Mereta clay loam. The abrupt layer of whitish indurated caliche at a depth of about 14 inches typically begins at a depth of about 17 inches.



Figure 12.—Profile of Rioconcho silty clay.

Tables

SOIL SURVEY

TABLE 1 POTENTIALS AND LIMITATIONS OF SOIL ASSOCIATIONS FOR SPECIFIED USES

Association	Percentage of county	Cultivated crops	Specialty crops	Range	Urban use	Recreation
Reagan	36	High; soil blowing, water erosion.	High; soil blowing; water eroion.	Medium; soil blowing, water erosion.	Medium; shrink-swell, corrosivity, low strength, seepage.	Medium; too clayey, dusty, slope.
Angelo-Rioconcho	20	High; water erosion.	High; water erosion.	Medium; water erosion.	Medium; shrink-swell, corrosivity, low strength, percolation, flooding.	Medium; too clayey, percolation, slope, flooding.
Conger	16	Low; slope, water erosion, soil blowing, cemented pan.	Low; slope, water erosion, soil blowing, cemented pan.	Low; available water capacity, cemented pan.	Low; slope, cemented pan.	Medium; slope, dusty, cemented pan.
Amarillo-Midessa	13	High; soil blowing, water erosion, slope.	High; soil blowing, water erosion, slope.	High; slope, soil blowing, water erosion.	High; seepage, low strength, corrosivity, slope.	High; slope.
Ector	10	Low; water erosion, slope, small stones, depth to rock.	Low; water erosion, slope, small stones, depth to rock.	Low; slope, small stones, depth to rock, water erosion.	Low; slope, small stones, depth to rock.	Medium; slope, small stones, depth to rock.
Patricia-Pyote	5	Medium; soil blowing, available water capacity.	Medium; soil blowing, available water capacity.	High; soil blowing, available water capacity.	High; seepage, low strength.	Medium; slope. too sandy.

TABLE 2.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AcA	Acuff loam, 0 to 1 percent slopes-----	2,550	0.5
AmA	Amarillo fine sandy loam, 0 to 1 percent slopes-----	11,970	2.2
AmB	Amarillo fine sandy loam, 1 to 3 percent slopes-----	20,660	3.7
AnA	Angelo silty clay loam, 0 to 1 percent slopes-----	55,430	10.0
AnB	Angelo silty clay loam, 1 to 3 percent slopes-----	23,000	4.1
ArB	Arvana fine sandy loam, 1 to 3 percent slopes-----	380	0.1
BcA	Bippus clay loam, 0 to 1 percent slopes-----	6,370	1.2
BfB	Blakeney fine sandy loam, 1 to 3 percent slopes-----	900	0.2
BrB	Broome clay loam, 1 to 3 percent slopes-----	7,070	1.3
CnC	Conger clay loam, 1 to 5 percent slopes-----	78,540	14.2
COD	Cottonwood association, undulating-----	850	0.2
ECD	Ector association, undulating-----	50,430	9.1
EsA	Estacado clay loam, 0 to 1 percent slopes-----	1,070	0.2
Lc	Lipan clay, depressional-----	5,670	1.0
Ls	Lipan stony clay-----	980	0.2
MeB	Mereta clay loam, 1 to 3 percent slopes-----	9,030	1.6
MfA	Midessa fine sandy loam, 0 to 1 percent slopes-----	16,000	2.9

SOIL SURVEY

TABLE 3.--CAPABILITY CLASSES AND SUBCLASSES

[All soils are assigned to nonirrigated capability subclasses (N). Only those potentially irrigable soils are assigned to irrigated subclasses (I). Miscellaneous areas are excluded. Dashes mean no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>
I (N)	---	---	---	---	---
(I)	244,734	---	---	---	---
II (N)	20,760	---	6,370	---	14,390
(I)	91,360	84,990	6,370	---	---
III (N)	163,710	103,870	---	4,410	55,430
(I)	53,040	53,040	---	---	---
IV (N)	225,914	45,150	5,670	180	174,914
(I)	---	---	---	---	---
V (N)	---	---	---	---	---
VI (N)	90,160	89,180	980	---	---
VII (N)	51,840	---	---	51,840	---
VIII (N)	---	---	---	---	---

GLASSCOCK COUNTY, TEXAS

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TABLE 4.--YIELDS PER ACRE OF CROPS

[Yields in columns N are for nonirrigated soils; those in columns I are for irrigated soils. All yields are those to be expected under a high level of management. Absence of a yield figure indicates the crop is seldom grown or is not suited]

Soil name and map symbol	Cotton		Grain sorghum		Wheat	
	N <u>Lb</u>	I <u>Lb</u>	N <u>Bu</u>	I <u>Bu</u>	N <u>Bu</u>	I <u>Bu</u>
Acuff:						
AcA-----	200	900	25	110	18	50
Amarillo:						
AmA-----	250	1,000	25	110	15	50
AmB-----	200	850	20	100	12	45
Angelo:						
AnA-----	200	1100	30	110	20	45
AnB-----	200	900	30	100	15	40
Arvana:						
ArB-----	175	700	20	85	12	45
Bippus:						
BcA-----	225	900	25	110	18	60
Blakeney:						
BfB-----	---	---	---	---	---	---
Broome:						
BrB-----	250	800	25	50	12	40
Conger:						
CnC-----	---	---	---	---	---	---
Cottonwood:						
¹ COD-----	---	---	---	---	---	---
Ector:						
¹ ECD-----	---	---	---	---	---	---
Estacado:						
EsA-----	200	750	25	100	18	45
Lipan:						
Lc-----	250	---	20	---	15	---
Ls-----	---	---	---	---	---	---
Mereta:						
MeB-----	150	---	20	---	15	---
Midessa:						
MfA-----	200	850	20	80	15	40
MfB-----	150	700	15	70	12	35
MfC-----	---	---	12	---	10	---
Monahans:						
MoC-----	---	---	---	---	---	---
Patricia:						
PaB-----	225	750	20	100	12	---
Potter:						
¹ PoD-----	---	---	---	---	---	---
Pyote:						
PyC-----	---	---	---	---	---	---

See footnote at end of table.

SOIL SURVEY

TABLE 4.-- YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Cotton		Grain sorghum		Wheat	
	N <u>Lb</u>	I <u>Lb</u>	N <u>Bu</u>	I <u>Bu</u>	N <u>Bu</u>	I <u>Bu</u>
Reagan:						
ReA-----	---	1,250	20	90	12	40
ReB-----	---	1,000	15	75	10	35
Rioconcho:						
Ro-----	200	1,000	30	110	20	45
Slaughter:						
ScA-----	---	---	---	---	---	---
Springer:						
SpB-----	175	600	20	75	---	---
Tobosa:						
ToA-----	250	---	30	---	20	---

¹This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

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TABLE 5.--RANGE PRODUCTIVITY AND COMPOSITION

[Soils not listed are not in range sites: such soils can be used for grazing if grass cover is established]

Soil name and map symbol	Range site	Potential production		Common plant name	Compo- sition
		Kind of year	Dry weight Lb/acre		
Acuff: AcA-----	Clay loam-----	Favorable Normal Unfavorable	2,100 1,600 1,200	Blue grama----- Buffalograss----- Vine-mesquite----- Side-oats grama----- Tobosa----- Other shrubs----- Other annual grasses----- Other perennial grasses----- Other annual forbs----- Other perennial forbs-----	30 25 10 5 5 5 5 5 5 5
Amarillo: AmA, AmB-----	Sandy loam-----	Favorable Normal Unfavorable	2,800 2,100 1,400	Black grama----- Side-oats grama----- Buffalograss----- Arizona cottontop----- Cane bluestem----- Plains bristlegrass----- Little bluestem----- Sand dropseed----- Other perennial grasses----- Other annual forbs----- Other perennial forbs----- Other shrubs-----	20 15 10 10 10 5 5 5 5 5 5 5
Angelo: AnA, AnB-----	Clay loam-----	Favorable Normal Unfavorable	2,400 1,700 1,300	Side-oats grama----- Cane bluestem----- Curly mesquite----- Buffalograss----- Vine-mesquite----- Tall dropseed----- Texas wintergrass----- Tobosa----- Slim tridens----- Other annual forbs----- Other shrubs-----	25 5 10 10 5 5 5 25 5 4 1
Arvana: ArB-----	Sandy loam-----	Favorable Normal Unfavorable	2,700 2,000 1,300	Black grama----- Side-oats grama----- Buffalograss----- Arizona cottontop----- Cane bluestem----- Plains bristlegrass----- Little bluestem----- Sand dropseed----- Other shrubs----- Other perennial grasses----- Other annual forbs----- Other perennial forbs-----	20 15 10 10 10 5 5 5 5 5 5 5
Bippus: BcA-----	Draw-----	Favorable Normal Unfavorable	3,000 2,400 1,800	Side-oats grama----- Vine-mesquite----- Blue grama----- Western wheatgrass----- Little bluestem----- Arizona cottontop-----	25 10 10 10 5 5

SOIL SURVEY

TABLE 5.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Compo- sition
		Kind of year	Dry weight		
			<u>Lb/acre</u>		<u>Pct</u>
Blakeney: BfB-----	Shallow-----	Favorable	1,400	Black grama-----	30
		Normal	1,000	Side-oats grama-----	25
		Unfavorable	700	Plains bristlegrass-----	10
				Arizona cottontop-----	5
				Buffalograss-----	5
				Sand dropseed-----	5
				Burrograss-----	5
				Other perennial forbs-----	10
				Other perennial grasses-----	5
Broome: BrB-----	Loamy-----	Favorable	2,100	Buffalograss-----	15
		Normal	1,200	Sideoats grama-----	10
		Unfavorable	600	Tobosa-----	10
				Burrograss-----	10
				Wright three-awn-----	10
				Vine-mesquite-----	5
				Plains bristlegrass-----	5
				Cane bluestem-----	5
				Fall witchgrass-----	5
				Sand dropseed-----	5
				Mesquite-----	5
				Other annual forbs-----	10
				Other shrubs-----	5
Conger: CnC-----	Shallow-----	Favorable	1,400	Black grama-----	30
		Normal	1,000	Side-oats grama-----	25
		Unfavorable	700	Plains bristlegrass-----	10
				Arizona cottontop-----	5
				Buffalograss-----	5
				Sand dropseed-----	5
				Burrograss-----	5
				Other perennial forbs-----	10
				Other perennial grasses-----	5
Cottonwood: ¹ COD-----	Gyp-----	Favorable	900	Side-oats grama-----	20
		Normal	650	Little bluestem-----	10
		Unfavorable	300	Sand dropseed-----	5
				Indiangrass-----	5
				Plains bristlegrass-----	5
				Vine-mesquite-----	5
				Arizona cottontop-----	5
				Tobosa-----	5
				Blue grama-----	5
				Hairy grama-----	5
				Buffalograss-----	5
				Black grama-----	5
				Other shrubs-----	5
				Other perennial grasses-----	10
				Other peennial forbs-----	5
Ector: ¹ ECD-----	Limestone hill-----	Favorable	900	Black grama-----	15
		Normal	700	Side-oats grama-----	15
		Unfavorable	400	Blue grama-----	10
				Slim tridens-----	5
				Bush muhly-----	5
				Cane bluestem-----	5
				Little bluestem-----	5
				Fall witchgrass-----	5
				Green sprangletop-----	5
				Plains bristlegrass-----	5
				Other perennial grasses-----	10
				Other perennial forbs-----	10
				Other shrubs-----	5

See footnote at end of table.

GLASSCOCK COUNTY, TEXAS

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TABLE 5.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Compo- sition
		Kind of year	Dry weight Lb/acre		
Estacado: EsA-----	Clay loam-----	Favorable	2,200	Blue grama-----	20
		Normal	1,700	Side-oats grama-----	30
		Unfavorable	1,300	Buffalograss-----	20
				Vine-mesquite-----	5
				Other perennial grasses-----	10
				Other annual grasses-----	5
				Other annual forbs-----	5
				Other perennial forbs-----	5
Lipan: Lc, Ls-----	Lakebed-----	Favorable	2,400	Buffalograss-----	25
		Normal	1,500	Vine-mesquite-----	15
		Unfavorable	500	White tridens-----	10
				Knotgrass-----	10
				Other perennial grasslikes-----	10
				Other annual forbs-----	10
				Other annual grasses-----	5
				Other perennial forbs-----	5
Mereta: MeB-----	Shallow-----	Favorable	1,500	Side-oats grama-----	25
		Normal	1,100	Buffalograss-----	13
		Unfavorable	800	Curly mesquite-----	10
				Slim tridens-----	10
				Wright three-awn-----	5
				Reverchon panicum-----	5
				Plains bristlegrass-----	5
				Cane bluestem-----	5
				Arizona cottontop-----	5
				Green sprangletop-----	5
				Texas wintergrass-----	5
				Other perennial forbs-----	5
				Other shrubs-----	2
Midessa: MfA, MfB, MfC-----	Sandy loam-----	Favorable	2,800	Black grama-----	20
		Normal	2,100	Side-oats grama-----	15
		Unfavorable	1,400	Buffalograss-----	10
				Arizona cottontop-----	10
				Cane bluestem-----	10
				Plains bristlegrass-----	5
				Little bluestem-----	5
				Sand dropseed-----	5
				Other perennial grasses-----	10
				Other annual grasses-----	5
				Other perennial forbs-----	5
Monahans: MoC-----	Sandy loam-----	Favorable	2,500	Black grama-----	20
		Normal	1,800	Blue grama-----	10
		Unfavorable	1,200	Sand dropseed-----	5
				Plains bristlegrass-----	5
				Arizona cottontop-----	5
				Hooded windmillgrass-----	5
				Slim tridens-----	5
				Fall witchgrass-----	5
				Side-oats grama-----	10
				Cane bluestem-----	10
				Other perennial forbs-----	10
				Other shrubs-----	5
				Other perennial grasses-----	5

SOIL SURVEY

TABLE 5.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Patricia:					
PaB-----	Loamy sand-----	Favorable	3,000	Little bluestem-----	30
		Normal	2,200	Side-oats grama-----	15
		Unfavorable	1,200	Blue grama-----	5
				Plains bristlegrass-----	5
				Sand dropseed-----	5
				Sand bluestem-----	5
				Sand lovegrass-----	5
				Hairy grama-----	5
				Other shrubs-----	10
				Other perennial grasses-----	10
				Other perennial forbs-----	5
Potter:					
¹ PoD-----	Very shallow-----	Favorable	900	Side-oats grama-----	30
		Normal	700	Blue grama-----	10
		Unfavorable	400	Little bluestem-----	10
				Buffalograss-----	10
				Arizona cottontop-----	5
				Hairy grama-----	5
				Black grama-----	5
				Other perennial grasses-----	10
				Other annual grasses-----	5
				Other perennial forbs-----	5
				Other shrubs-----	5
Pyote:					
PyC-----	Sandy-----	Favorable	2,400	Little bluestem-----	15
		Normal	1,800	Sand bluestem-----	5
		Unfavorable	1,200	Cane bluestem-----	10
				Side-oats grama-----	10
				Giant dropseed-----	5
				Sand dropseed-----	5
				Plains bristlegrass-----	5
				Arizona cottontop-----	5
				Black grama-----	5
				Hooded windmillgrass-----	10
				Other perennial forbs-----	10
				Other shrubs-----	10
				Other perennial grasses-----	5
Reagan:					
ReA, ReB-----	Loamy-----	Favorable	1,800	Tobosa-----	20
		Normal	1,200	Buffalograss-----	15
		Unfavorable	600	Side-oats grama-----	15
				Burrograss-----	15
				Vine-mesquite-----	5
				Fall witchgrass-----	5
				Sand muhly-----	5
				Other perennial grasses-----	10
				Other shrubs-----	5
				Other annual grasses-----	5
Rioconcho:					
Ro-----	Clayey bottomland-----	Favorable	3,500	Tobosa-----	30
		Normal	3,000	Buffalograss-----	15
		Unfavorable	2,000	Side-oats grama-----	20
				Vine-mesquite-----	15
				Silver bluestem-----	5
				Curly mesquite-----	5
				Texas wintergrass-----	3
				Other annual forbs-----	5
				Other shrubs-----	2

See footnote at end of table.

TABLE 5.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Compo- sition
		Kind of year	Dry weight Lb/acre		
Slaughter: ScA-----	Clay loam-----	Favorable	2,000	Buffalograss-----	25
		Normal	1,500	Blue grama-----	25
		Unfavorable	1,000	Tobosa-----	15
				Side-oats grama-----	10
				Vine-mesquite-----	5
				Cane bluestem-----	5
				Other perennial grasses-----	10
				Other perennial forbs-----	5
Springer: SpB-----	Loamy sand-----	Favorable	2,500	Little bluestem-----	15
		Normal	1,800	Side-oats grama-----	10
		Unfavorable	1,200	Blue grama-----	10
				Plains bristlegrass-----	5
				Arizona cottontop-----	5
				Sand dropseed-----	5
				Hooded windmillgrass-----	5
				Sand bluestem-----	5
				Yellow indiagrass-----	5
				Switchgrass-----	5
				Spike dropseed-----	5
				Other perennial grasses-----	10
				Other shrubs-----	10
				Other perennial forbs-----	5
Tobosa: ToA-----	Clay flat-----	Favorable	2,400	Tobosa-----	40
		Normal	1,700	Buffalograss-----	15
		Unfavorable	1,000	Side-oats grama-----	10
				Curly mesquite-----	5
				Cane bluestem-----	5
				Vine-mesquite-----	5
				Texas wintergrass-----	5
				Wright three-awn-----	5
				Other annual forbs-----	5
				Other perennial forbs-----	5

¹This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

SOIL SURVEY

TABLE 6.--BUILDING SITE DEVELOPMENT

["Shrink-swell" and other terms that describe restrictive soil features are defined in the Glossary. See text definition of "slight," "moderate," and "severe". Absence of an entry means soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Acuff: AcA-----	Slight-----	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.
Amarillo: AmA, AmB-----	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: low strength.
Angelo: AnA, AnB-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Arvana: ArB-----	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight.
Bippus: BcA-----	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Blakeney:					

TABLE 6.--BUILDING SITE DEVELOPMENT--Continued

Soil name and classification	Shallow foundations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Patricia: PaB-----	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: low strength.
Potter: PoD-----	Moderate: small stones.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.
Pyote: PyC-----	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight.
Reagan: ReA, ReB-----	Moderate: too clayey.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.
Rioconcho:					

SOIL SURVEY

TABLE 7.—SANITARY FACILITIES

["Shrink-swell" and other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe" used to rate soils. Absence of an entry means the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Acuff: AcA-----	Slight-----	Moderate: seepage.	Slight-----	Slight-----	Good.
Amarillo: AmA, AmB-----	Slight-----	Moderate: seepage.	Slight-----	Slight-----	Good.
Angelo: AnA, AnB-----	Severe: percs slowly.	Moderate: seepage.	Severe: too clayey.	Slight-----	Fair.
Arvana: ArB-----	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight-----	Fair: thin layer.
Bippus: BcA-----	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
Blakeney: BfB-----	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Slight-----	Poor: thin layer.
Broome: BrB-----	Slight-----	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Conger: CnC-----	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Slight-----	Poor: thin layer.
Cottonwood: 1COD-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight-----	Poor: thin layer.
Ector: 1ECD-----	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Slight-----	Poor: thin layer, small stones.
Estacado: EsA-----	Slight-----	Moderate: seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Lipan: Lc, Ls-----	Severe: floods, percs slowly.	Slight-----	Severe: floods, too clayey.	Severe: floods.	Poor: too clayey.
Mereta: MeB-----	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Moderate: cemented pan.	Slight-----	Poor: thin layer.
Midessa: MfA-----	Slight-----	Moderate: seepage.	Slight-----	Slight-----	Good.
MfB, MfC-----	Slight-----	Moderate: seepage, slope.	Slight-----	Slight-----	Good.

TABLE 7.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Monahans: MoC-----	Slight-----	Moderate: slope, seepage.	Slight-----	Slight-----	Good.
Patricia: PaB-----	Slight-----	Moderate: seepage.	Slight-----	Slight-----	Good.
Potter: ¹ PoD-----	Severe: seepage.	Moderate: seepage.	Moderate: small stones.	Slight-----	Poor: thin layer.
Pyote: PyC-----	Slight-----	Severe: seepage.	Slight-----	Slight-----	Fair: too sandy.
Reagan: ReA, ReB-----	Slight-----	Moderate: seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Rioconcho: Ro-----	Severe: percs slowly, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
Slaughter: SoA-----	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight-----	Poor: thin layer.
Springer: SpB-----	Slight-----	Severe: seepage.	Slight-----	Slight-----	Fair: too sandy.
Tobosa: ToA-----	Severe: percs slowly.	Slight-----	Severe: too clayey.	Slight-----	Poor: too clayey.

¹This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

SOIL SURVEY

TABLE 8.--CONSTRUCTION MATERIALS

["Shrink-swell" and other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry means soil was not rated]

Soil name and map symbol	Road fill	Sand	Gravel	Topsoil
Acuff: AcA-----	Fair: low strength.	Unsuited-----	Unsuited-----	Fair: too clayey.
Amarillo: AmA, AmB-----	Fair: low strength.	Unsuited-----	Unsuited-----	Fair: thin layer.
Angelo: AnA, AnB-----	Poor: shrink-swell, low strength.	Unsuited-----	Unsuited-----	Fair: too clayey.
Arvana: ArB-----	Poor: thin layer.	Unsuited-----	Unsuited-----	Fair: thin layer.
Bippus: BcA-----	Fair: low strength, shrink-swell.	Unsuited-----	Unsuited-----	Fair: too clayey.
Blakeney: BfB-----	Poor: thin layer.	Unsuited-----	Unsuited-----	Fair: thin layer.
Broome: BrB-----	Fair: low strength, shrink-swell.	Unsuited-----	Unsuited-----	Fair: excess lime, too clayey.
Conger: CnC-----	Poor: thin layer.	Unsuited-----	Unsuited-----	Fair: thin layer.
Cottonwood: ¹ COD-----	Poor: thin layer.	Unsuited-----	Unsuited-----	Poor: thin layer, excess salt.
Ector: ¹ ECD-----	Poor: thin layer.	Unsuited-----	Unsuited-----	Poor: thin layer, small stones.
Estacado: EsA-----	Fair: low strength.	Unsuited-----	Unsuited-----	Fair: too clayey, excess lime.
Lipan: Lc, Ls-----	Poor: shrink-swell, low strength.	Unsuited-----	Unsuited-----	Poor: too clayey.
Mereta: MeB-----	Fair: shrink-swell, low strength.	Unsuited-----	Unsuited-----	Poor: area reclaim.
Midessa: MfA, MfB, MfC-----	Fair: low strength.	Unsuited-----	Unsuited-----	Fair: thin layer.

See footnote at end of table.

TABLE 8.—CONSTRUCTION MATERIALS—Continued

Soil name and map symbol	Road fill	Sand	Gravel	Topsoil
Monahans: MoC-----	Fair: low strength.	Unsuited-----	Unsuited-----	Fair: thin layer.
Patricia: PaB-----	Good-----	Unsuited-----	Unsuited-----	Poor: too sandy.
Potter: ¹ PoD-----	Good-----	Unsuited-----	Unsuited-----	Poor: thin layer, small stones.
Pyote: PyC-----	Good-----	Poor: excess fines.	Unsuited-----	Poor: too sandy.
Reagan: ReA, ReB-----	Fair: low strength, shrink-swell.	Unsuited-----	Unsuited-----	Fair: too clayey, excess lime.
Rioconcho: Ro-----	Poor: shrink-swell.	Unsuited-----	Unsuited-----	Poor: too clayey.
<hr/>				
	low strength.			
Slaughter: SoA-----	Poor: thin layer, low strength.	Unsuited-----	Unsuited-----	Fair: thin layer, too clayey.
Springer: SpB-----	Good-----	Poor: excess fines.	Unsuited-----	Poor: too sandy.
Tobosa: ToA-----	Poor: shrink-swell, low strength.	Unsuited-----	Unsuited-----	Poor: too clayey.

¹This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the

SOIL SURVEY

TABLE 9.--WATER MANAGEMENT

["Seepage," "slope," and other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not evaluated]

Soil name and map symbol	Limitations for--			Features affecting--	
	Pond resevoir areas	Embankments, dikes, and levees	Irrigation	Terraces and diversions	Grassed waterways
Acuff: AcA-----	Moderate: seepage.	Moderate: seepage.	Erodes easily----	Favorable-----	Favorable.
Amarillo: AmA, AmB-----	Moderate: seepage.	Moderate: seepage, piping.	Erodes easily----	Favorable-----	Favorable.
Angelo: AnA, AnB-----	Moderate: seepage.	Moderate: compressible.	Slow intake-----	Favorable-----	Favorable.
Arvana: ArB-----	Severe: cemented pan.	Moderate: thin layer.	Erodes easily, rooting depth.	Cemented pan, rooting depth.	Rooting depth.
Bippus: BcA-----	Moderate: seepage.	Moderate: low strength, shrink-swell.	Favorable-----	Favorable-----	Favorable.
Blakeney: BfB-----	Severe: cemented pan, seepage.	Severe: thin layer, seepage.	Rooting depth, droughty.	Cemented pan----	Rooting depth, droughty.
Broome: BrB-----	Moderate: seepage.	Moderate: compressible, piping.	Droughty, excess lime.	Favorable-----	Favorable.
Conger: CnC-----	Severe: cemented pan, seepage.	Severe: thin layer, seepage.	Rooting depth, droughty.	Cemented pan----	Rooting depth, droughty.

[illegible]

SOIL SURVEY

TABLE 10.--RECREATIONAL DEVELOPMENT

["Shrink-swell" and other terms that describe restrictive soil features are defined in the Glossary.
See text for definitions of "slight," "moderate," and "severe"]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Acuff: AcA-----	Slight-----	Slight-----	Slight-----	Slight.
Amarillo: AmA-----	Slight-----	Slight-----	Slight-----	Slight.
AmB-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Angelo: AnA, AnB-----	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey.
Arvana: ArB-----	Slight-----	Slight-----	Moderate: slope, depth to rock.	Slight.
Bippus: BcA-----	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
Blakeney: BfB-----	Moderate: dusty.	Moderate: dusty.	Severe: depth to rock.	Moderate: dusty.
Broome: BrB-----	Moderate: dusty, too clayey.	Moderate: dusty, too clayey.	Moderate: dusty, too clayey, slope.	Moderate: dusty, too clayey.
Conger: CnC-----	Moderate: dusty.	Moderate: dusty.	Severe: depth to rock.	Moderate: dusty.
Cottonwood: 1C0D-----	Moderate:	Moderate:	Moderate:	Moderate:

TABLE 10. RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Midessa: MfB, MfC-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Monahans: MoC-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
Patricia: PaB-----	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
Potter: ¹ Pod-----	Slight-----	Slight-----	Moderate: slope, small stones.	Slight.
Pyote: PyC-----	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.
Reagan: ReA-----	Moderate: too clayey, dusty.	Moderate: too clayey, dusty.	Moderate: too clayey, dusty.	Moderate: too clayey, dusty.
ReB-----	Moderate: too clayey, dusty.	Moderate: too clayey, dusty.	Moderate: slope, dusty.	Moderate: too clayey, dusty.
Rioconcho: Ro-----	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Slaughter: ScA-----	Moderate: percs slowly, too clayey.	Moderate: too clayey.	Severe: depth to rock.	Moderate: too clayey.
Springer: SpB-----	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
Tobosa: ToA-----	Severe: percs slowly, too clayey.	Severe: too clayey.	Severe: percs slowly, too clayey.	Severe: too clayey.

¹This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the

SOIL SURVEY

TABLE 11.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates the soil was not rated]

Soil name and map symbol	Potential for habitat elements				Potential as habitat for--	
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Openland wildlife	Rangeland wildlife
Acuff:						
AcA-----	Fair	Fair	Fair	Fair	Fair	Fair.
Amarillo:						
AmA, AmB-----	Fair	Fair	Fair	Fair	Fair	Fair.
Angelo:						
AnA, AnB-----	Fair	Fair	Fair	Fair	Fair	Fair.
Arvana:						
ArB-----	Fair	Fair	Fair	Fair	Fair	Fair.
Bippus:						
BcA-----	Good	Good	Good	Good	Good	Good
Blakeney:						
BfB-----	Poor	Poor	Fair	Fair	Poor	Fair.
Broome:						
BrB-----	Fair	Fair	Fair	Fair	Fair	Fair.
Conger:						
CnC-----	Poor	Poor	Fair	Fair	Poor	Fair.
Cottonwood:						
¹ COD-----	Very poor.	Very poor.	Poor	Poor	Very poor.	Poor.
Ector:						
¹ ECD-----	Very poor.	Very poor.	Fair	Fair	Poor	Fair.
Estacado:						
EsA-----	Fair	Fair	Fair	Fair	Fair	Fair.
Lipan:						
Lc-----	Fair	Fair	Fair	Very poor.	Fair	Poor.
Ls-----	Poor	Poor	Poor	Very poor.	Poor	Very poor.
Mereta:						
MeB-----	Fair	Fair	Fair	Fair	Fair	Fair.
Midessa:						
MfA, MfB, MfC-----	Fair	Fair	Fair	Fair	Fair	Fair.
Monahans:						
MoC-----	Poor	Poor	Fair	Fair	Poor	Fair.
Patricia:						
PaB-----	Poor	Fair	Fair	Fair	Fair	Fair.
Potter:						
¹ Pod-----	Very poor.	Very poor.	Poor	Poor	Very poor.	Poor.
Pyote:						
PyC-----	Poor	Fair	Fair	Fair	Fair	Fair.
Reagan:						
ReA, ReB-----	Fair	Good	Fair	Fair	Fair	Fair.
Rioconcho:						
Ro-----	Good	Good	Fair	Good	Good	Fair.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements				Potential as habitat for--	
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Openland wildlife	Rangeland wildlife
Slaughter: ScA-----	Poor	Poor	Fair	Fair	Poor	Fair.
Springer: SpB-----	Poor	Fair	Fair	Fair	Fair	Fair.
Tobosa: ToA-----	Fair	Fair	Poor	Fair	Fair	Poor.

¹This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

SOIL SURVEY

TABLE 12.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means greater than. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	<u>In</u>				<u>Pct</u>					<u>Pct</u>	
Acuff:											
AcA-----	0-8	Loam-----	CL	A-4, A-6	0	100	95-100	95-100	51-70	24-32	10-16
	8-45	Clay loam, sandy clay loam, loam.	CL	A-6, A-7-6	0	100	95-100	95-100	65-75	28-45	12-25
	45-80	Clay loam, sandy clay loam, loam.	CL	A-6, A-7-6	0	95-100	90-100	90-100	60-75	25-42	12-25
Amarillo:											
AmA, AmB-----	0-8	Fine sandy loam	SM, SM-SC, CL-ML	A-2-4, A-4	0	100	100	95-100	35-55	17-25	3-7
	8-52	Sandy clay loam, clay loam.	SC, SM-SC, CL	A-4, A-6, A-2-4	0	100	100	95-100	35-65	20-40	7-20
	52-80	Sandy clay loam, clay loam.	SC, CL, SM-SC	A-4, A-6, A-2-4	0	90-100	90-100	65-98	35-70	20-35	7-17
Angelo:											
AnA, AnB-----	0-8	Silty clay loam	CL	A-6, A-7-6	0	90-100	90-100	85-100	60-90	37-50	16-27
	8-26	Clay, silty clay, clay loam	CL, CH	A-6, A-7-6	0	90-100	90-100	85-100	70-92	39-60	18-35
	26-80	Clay loam, silty clay loam, clay, silty clay.	CL, CH	A-6, A-7-6	0	60-100	60-100	60-100	50-90	35-55	15-30
Arvana:											
ArB-----	0-9	Fine sandy loam	SM, SM-SC	A-2-4, A-4	0	100	100	75-95	30-50	17-25	2-7
	9-28	Sandy clay loam	SC, CL, CL-ML, SM-SC	A-4, A-6	0	100	100	80-98	36-65	20-35	5-18
	28-40	Variable, indurated, caliche.									
	40-70	Variable, caliche.									
Bippus:											
BcA-----	0-24	Clay loam-----	CL, SC, SM-SC	A-4, A-6	0	100	95-100	85-98	36-80	22-40	7-20
	24-62	Clay loam, loam, sandy clay loam.	SC, CL, SM-SC	A-4, A-6	0	100	95-100	85-98	36-75	22-40	7-20
Blakeney:											
BfB-----	0-13	Fine sandv loam	SC, CL.	A-4.	0-5	75-95	70-95	60-85	30-55	18-27	4-10

TABLE 12.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	<u>In</u>				<u>Pct</u>					<u>Pct</u>	
Conger: CnC-----	0-18 18-35 35-60	Clay loam Variable, indurated, caliche. Variable, caliche.	CL, CL-ML	A-4, A-6	0-5	75-95	70-95	65-90	51-75	20-40	5-20
Cottonwood: 1COD-----	0-7 7-20	Loam Variable, chalky gypsum.	CL, CL-ML	A-4, A-6	0	100	100	85-100	55-75	20-35	4-15
Ector: 1ECD-----	0-9 9-40	Gravelly clay loam. Variable, fractured lime- stone bedrock.	GC, SC	A-2-4, A-2-6	5-45	30-70	20-65	15-50	13-35	25-35	8-15
Estacado: EsA-----	0-16 16-25 25-80	Clay loam Clay loam, sandy clay loam. Clay loam, sandy clay loam.	CL CL CL	A-6, A-4 A-6, A-7-6 A-6, A-7-6	0 0 0	95-100 95-100 95-100	95-100 95-100 95-100	55-100 85-100 80-100	51-90 55-90 60-95	25-40 30-42 30-45	8-20 12-25 13-25
Lipan: Lc-----	0-55 55-70	Clay Clay, silty clay	CH CH	A-7-6 A-7-6	0 0	85-100 85-100	80-100 80-100	80-100 80-100	80-95 70-95	55-75 46-66	32-49 25-40
Ls-----	0-55 55-70	Stony clay Clay, silty clay	CH CH	A-7-6 A-7-6	0-15 0-15	85-100 85-100	80-100 80-100	80-100 80-100	80-95 70-95	55-75 46-66	32-49 25-40
Mereta: MeB-----	0-17 17-35 35-60	Clay loam Variable, indurated, caliche. Variable, limy earth.	CL, CH	A-6, A-7-6	0-5	90-100	83-100	80-97	60-85	39-52	19-30
Midessa: MfA, MfB, MfC-----	0-9 9-34 34-80	Fine sandy loam Sandy clay loam Sandy clay loam, clay loam.	SM, SM-SC, CL, SC CL, SC, SM-SC, CL-ML CL, SC, SM-SC, CL-ML	A-2-4, A-4 A-6, A-4 A-6, A-4	0 0 0	95-100 95-100 90-100	95-100 95-100 90-100	85-100 90-100 80-100	30-55 36-80 40-80	17-27 22-35 22-35	4-9 7-17 7-17
Monahans: MoC-----	0-6 6-17 17-60	Fine sandy loam Loam, sandy clay loam, fine sandy loam. Loam, fine sandy loam, sandy clay loam.	SM, SC, SM-SC SC, CL, SM-SC, CL-ML SC, CL, SM-SC, CL-ML	A-2-4, A-4, A-6 A-2-4, A-4, A-6, A-2-6 A-2-4, A-2-6, A-4, A-6	0 0 0	90-100 90-100 75-100	90-100 90-100 70-95	70-98 80-98 55-90	25-50 30-65 25-60	18-30 20-35 20-35	3-12 4-15 4-15

SOIL SURVEY

TABLE 12.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	<u>In</u>				<u>Pct</u>					<u>Pct</u>	
Patricia: PaB-----	0-14	Loamy fine sand	SM, SP-SM, SM-SC	A-2-4	0	100	95-100	95-100	5-30	<24	NP-4
	14-80	Sandy clay loam	SC, SM-SC	A-2-4, A-2-6, A-4, A-6	0	100	95-100	95-100	30-45	20-35	7-18
Potter: PoD-----	0-7	Loam-----	CL, ML, CL-ML	A-4, A-6	0-5	70-95	70-95	60-85	51-70	20-40	5-20
	7-30	Variable, caliche.	GM, GC, SM, SC	A-2-4, A-4, A-6, A-2-6	5-50	30-80	25-75	20-60	13-50	20-40	5-20
Pyote: PyC-----	0-26	Fine sand-----	SM, SP-SM	A-2-4, A-3	0	100	100	95-100	5-20	<22	NP-3
	26-80	Fine sandy loam, loamy fine sand, fine sand	SM, SM-SC	A-2-4	0	100	100	95-100	13-30	<25	NP-7
Reagan: ReA, ReB-----	0-29	Silty clay loam	CL	A-6, A-7-6	0	95-100	95-100	90-100	70-95	35-45	18-28
	29-80	Silty clay, silty clay loam, loam. clay loam.	CL	A-6, A-7-6	0	95-100	95-100	85-100	65-95	35-50	18-30
Rioconcho: Ro-----	0-80	Silty clay, silty clay loam.	CL, CH	A-6, A-7-6	0-10	85-100	83-100	75-100	70-97	39-62	20-38
Slaughter: SoA-----	0-8	Clay loam-----	CL	A-6	0	100	100	85-100	55-75	28-40	11-20
	8-18	Clay loam, clay	CL	A-6, A-7-6	0	95-100	95-100	90-100	65-90	35-50	17-30
	18-20	Variable, indurated, caliche.									
Springer: SpB-----	0-17	Loamy fine sand	SM, SP-SM, SM-SC	A-2-4, A-3	0	98-100	95-100	70-96	8-25	<22	NP-4
	17-80	Fine sandy loam	SM, SM-SC	A-2-4	0	98-100	95-100	75-99	11-35	18-25	2-7
Tobosa: ToA-----	0-56	Clay-----	CH	A-7-6	0-5	80-100	75-100	75-100	75-98	51-72	30-45
	56-65	Clay, silty clay silty clay loam	CH, CL	A-7-6	0-5	80-100	75-100	75-100	70-95	45-65	25-40

¹This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

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TABLE 13.—PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[Dashes indicate data were not available. The symbol < means less than; > means greater than. The erosion tolerance factor (T) is for the entire profile. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
						Uncoated steel	Concrete	K	T	
	<u>In</u>	<u>In/hr</u>	<u>In/in</u>	<u>pH</u>						
Acuff:										
AcA-----	0-8	0.6-2.0	0.12-0.18	6.6-7.8	Low-----	Moderate	Low-----	0.28	5	5
	8-45	0.6-2.0	0.14-0.19	7.4-8.4	Low-----	Moderate	Low-----	0.32		
	45-80	0.6-2.0	0.10-0.16	7.9-8.4	Low-----	Moderate	Low-----	0.32		
Amarillo:										
AmA, AmB-----	0-8	2.0-6.0	0.11-0.15	6.6-7.8	Low-----	Low-----	Low-----	0.24	5	3
	8-52	0.6-2.0	0.14-0.18	7.4-8.4	Low-----	Moderate	Low-----	0.32		
	52-80	0.6-2.0	0.10-0.15	7.9-8.4	Low-----	Moderate	Low-----	0.32		
Angelo:										
AnA, AnB-----	0-8	0.6-2.0	0.14-0.20	7.9-8.4	Moderate	Moderate	Low-----	0.32	4	6
	8-26	0.2-0.6	0.14-0.20	7.9-8.4	High-----	High-----	Low-----	0.32		
	26-80	0.6-2.0	0.14-0.20	7.9-8.4	Moderate	Moderate	Low-----	0.32		
Arvana:										
ArB-----	0-9	2.0-6.0	0.11-0.15	6.6-8.4	Low-----	Low-----	Low-----	0.24	2	3
	9-28	0.6-2.0	0.12-0.18	7.4-8.4	Low-----	Moderate	Low-----	0.32		
	28-40									
	40-70									
Bippus:										
BcA-----	0-24	0.6-2.0	0.14-0.20	7.4-8.4	Moderate	Moderate	Low-----	0.28	5	6
	24-62	0.6-2.0	0.14-0.20	7.9-8.4	Moderate	Moderate	Low-----	0.28		
Blakeney:										
BfB-----	0-13	2.0-6.0	0.08-0.15	7.9-8.4	Low-----	Moderate	Low-----	0.24	1	3
	13-35									
	35-60									
Broome:										
BrB-----	0-7	0.6-2.0	0.12-0.18	7.9-8.4	Moderate	Moderate	Low-----	0.37	5	6
	7-36	0.6-2.0	0.10-0.15	7.9-8.4	Moderate	Moderate	Low-----	0.37		
	36-70	0.6-2.0	0.12-0.18	7.9-8.4	Moderate	Moderate	Low-----	0.49		
Conger:										
CnC-----	0-18	0.6-2.0	0.10-0.18	7.9-8.4	Low-----	Moderate	Low-----	0.28	1	4L
	18-35									
	35-70									
Cottonwood:										
¹ COD-----	0-7	0.6-2.0	0.11-0.18	7.9-8.4	Low-----	High-----	Moderate	0.32	1	4L
	7-20									
Ector:										
¹ ECD-----	0-9	0.6-2.0	0.05-0.12	7.9-8.4	Very low	High-----	Low-----	0.28	1	8
	9-40									
Estacado:										
EsA-----	0-16	0.6-2.0	0.14-0.19	7.9-8.4	Low-----	Moderate	Low-----	0.28	5	4L
	16-25	0.6-2.0	0.12-0.18	7.9-8.4	Low-----	Moderate	Low-----	0.32		
	25-80	0.6-2.0	0.10-0.18	7.9-8.4	Low-----	Moderate	Low-----	0.32		
Lipan:										
Lc, Ls-----	0-55	<0.06	0.13-0.18	7.4-8.4	Very high	High-----	Low-----	0.32	5	4
	55-70	<0.06	0.13-0.18	7.9-8.4	Very high	High-----	Low-----	0.32		
Mereta:										
MeB-----	0-17	0.2-0.6	0.15-0.20	7.9-8.4	Moderate	High-----	Low-----	0.32	2	6
	17-35									
	35-60									
Midessa:										
MfA, MfB, MfC-----	0-9	2.0-6.0	0.10-0.15	7.9-8.4	Low-----	Moderate	Low-----	0.24	3	3
	9-34	0.6-2.0	0.12-0.18	7.9-8.4	Low-----	Moderate	Low-----	0.32		
	34-80	0.6-2.0	0.10-0.16	7.9-8.4	Low-----	Moderate	Low-----	0.32		

See footnote at end of table.

SOIL SURVEY

TABLE 13.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

[illegible]

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TABLE 14.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. The symbol < means less than; > means greater than]

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Cemented pan	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness
Acuff:					In		In	
AcA-----	B	None-----	---	---	>60	---	---	---
Amarillo:								
AmA, AmB-----	B	None-----	---	---	>60	---	---	---
Angelo:								
AnA, AnB-----	C	None-----	---	---	>60	---	---	---
Arvana:								
ArB-----	C	None-----	---	---	>60	---	20-40	Rip-pable.
Bippus:								
BcA-----	B	None to common.	Very brief	Apr-Oct	>60	---	---	---
Blakeney:								
BfB-----	C	None-----	---	---	>60	---	12-20	Rip-pable.
Broome:								
BrB-----	B	None-----	---	---	>60	---	---	---
Conger:								
CnC-----	C	None-----	---	---	>60	---	12-20	Rip-pable.
Cottonwood:								
¹ COD-----	C	None-----	---	---	3-12	Rip-pable.	---	---
Ector:								
¹ ECD-----	D	None-----	---	---	4-20	Hard	---	---
Estacado:								
EsA-----	B	None-----	---	---	>60	---	---	---
Lipan:								
Lc, Ls-----	D	Rare to common.	Long to very long.	Apr-Jun	>60	---	---	---
Mereta:								
MeB-----	C	None-----	---	---	>60	---	14-20	Rip-pable.

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MfA, MfB, MfC-----	B	None-----	---	---	>60	---	---	---
Monahans:								
MoC-----	B	None-----	---	---	>60	---	---	---
Patricia:								
PaB-----	B	None-----	---	---	>60	---	---	---
Potter:								
¹ PoD-----	C	None-----	---	---	>60	---	---	---
Pyote:								
PyC-----	A	None-----	---	---	>60	---	---	---

SOIL SURVEY

TABLE 14.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Cemented pan	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness
Rioconcho: Ro-----	C	Rare to common.	Very brief to brief.	Apr-Jun	<u>In</u> >60	---	<u>In</u> ---	---
Slaughter: ScA-----	C	None-----	---	---	>60	---	9-20	Rip- pable.
Springer: SpB-----	B	None-----	---	---	>60	---	---	---
Tobosa: ToA-----	D	None-----	---	---	>60	---	---	---

¹This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

SOIL SURVEY

TABLE 16.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics of this taxadjunct that are outside the range of the series]

Soil name	Family or higher taxonomic class
Acuff-----	Fine-loamy, mixed, thermic Aridic Paleustolls
Amarillo-----	Fine-loamy, mixed, thermic Aridic Paleustalfs
Angelo-----	Fine, mixed, thermic Torrenitic Calcicustolls
Arvana-----	Fine-loamy, mixed, thermic Petrocalcic Paleustalfs
As-----	Fine-loamy, mixed, thermic Aridic Paleustolls

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